2007 - 2009

Puget Sound Conservation & Recovery Plan

Public Review Draft

April 15, 2006

PUGET SOUND ACTION TEAM

Office of the Governor, State of Washington

Puget Sound Action Team

Representatives from the following governments serve on the Action Team:

Washington State

Community, Trade and Economic Development
Conservation Commission
Department of Agriculture
Department of Ecology
Department of Fish and Wildlife
Department of Health
Department of Natural Resources
Department of Transportation
Interagency Committee for Outdoor Recreation
Parks and Recreation Commission

Tribal Government

Tulalip Tribes, representing Puget Sound Tribes

Local Government

City of Burien, representing Puget Sound cities
Whatcom County, representing Puget Sound counties

Federal Government *(non-voting)*

NOAA Fisheries
U.S. Environmental Protection Agency
U.S. Fish & Wildlife Service

Chair: Director of Puget Sound Action Team staff

Puget Sound Council

The Puget Sound Council provides advice and guidance to the Action Team and is made up of the following:

- Seven representatives of key Puget Sound interests, including tribal governments, counties, cities, agriculture, business, environmental organizations, and the shellfish industry.
- Four representatives of the Washington State Legislature, two from the House of Representatives and two from the Senate.
- Chair of the Action Team.

2007-2009

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How to Submit Comments:

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5 p.m. on **May 15, 2006** by one of the following:

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To obtain this publication in an alternative format, please contact the Action Team's ADA Coordinator at (360) 725-5444. The Action Team's TDD number is (800) 833-6388.

This report is available on the Puget Sound Action Team's Web site at www.psat.wa.gov/2007-2009plan.

Publication No. PSAT 06-04

Abbreviations

Washington State agencies

Agriculture	WSDA
Community, Trade and Economic Development	CTED
Conservation Commission	WSCC
Ecology	Ecology
Fish and Wildlife	WDFW
Governor's Salmon Recovery Office	GSRO
Health	Health
Interagency Committee for Outdoor Recreation	IAC
Natural Resources	DNR
Parks and Recreation Commission	State Parks
Puget Sound Action Team staff	PSAT
Transportation	WSDOT
Washington State University Extension	WSU Extension
Washington Sea Grant Program	Sea Grant

Federal government agencies

Environmental Protection Agency	EPA
National Atmospheric and Oceanic Administration	NOAA
NOAA National Marine Fisheries Service	NOAA Fisheries
U.S. Army Corps of Engineers	ACOE
U.S. Fish and Wildlife Service	USFWS
U.S. Geological Survey	USGS

Other entities

Hood Canal Coordinating Council	HCCC
Hood Canal Dissolved Oxygen Project	HCDOP
Northwest Indian Fisheries Commission	NWIFC
Northwest Straits Commission	NWSC
Puget Sound Nearshore Project	PSNP

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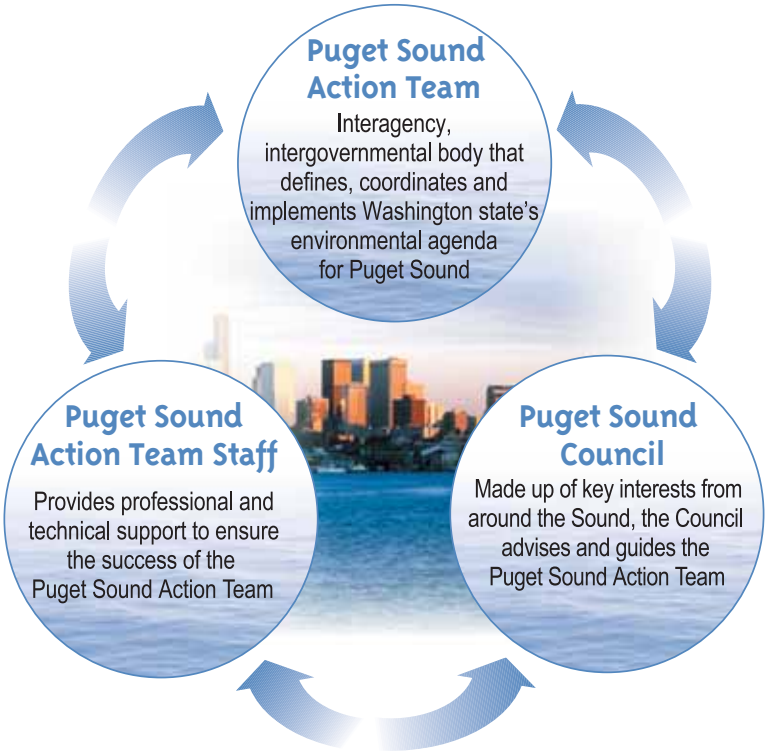
Introduction



The Puget Sound Action Team (Action Team), created in law in 1996, is charged with defining, coordinating and putting into action the state's environmental protection and restoration agenda for Puget Sound. The Action Team is made up of state agencies and federal, tribal and local government representatives. The Puget Sound Council, which advises the Action Team, is composed of diverse interest groups, state legislators and tribal and local government representatives.

Public review of this draft *2007-2009 Puget Sound Conservation and Recovery Plan* is the first step in developing a final plan and budget to guide the state's work on Puget Sound from July 1, 2007 to June 30, 2009. This is the sixth such biennial plan developed by the Action Team. These biennial plans are the way the state implements the *Puget Sound Water Quality Management Plan,* the long-term comprehensive plan adopted by the state and federal governments to protect and restore Puget Sound. The Action Team and Council developed this draft plan to get the public's opinions and ideas about where we should focus efforts during the two-year budget period.

The Puget Sound Action Team has identified eight core priorities as the most important for our work together in Puget Sound, but has not ranked any priority over the others in importance:

- Clean up contaminated sites and sediments.
- Prevent toxic contamination.
- Prevent harm from stormwater runoff.
- Prevent nutrient and pathogen pollution.
- Protect functioning nearshore and freshwater habitats.
- Restore degraded nearshore and freshwater habitats.

- Conserve and recover species at risk.
- Prepare for and adapt Puget Sound efforts to a changing climate.

Education and public involvement is an overarching strategy used throughout this entire plan. The Action Team recognizes that public understanding and involvement is critical to achieving progress on each of these priorities. The Action Team staff and agencies support and contribute to public environmental education at all levels of government. Some of those activities and programs are included in priority sections of this plan and funded through the Puget Sound budget. Citizen and community groups, schools and universities, local and tribal governments, farmers, businesses, industries, and trade associations throughout the Sound give time and resources to environmental education programs. The public's positive response to these activities is evidence that Puget Sound is the center of a community that cares deeply about protecting the diversity and resources the Sound provides.

How the 2007-2009 Plan relates to the Puget Sound Partnership

The Puget Sound Partnership, a public-private effort, was created by Governor Chris Gregoire in December 2005 to make recommendations on a 2020 action agenda for Puget Sound as well as recommendations on how to improve the use of science, organizational structure and governance and how to increase funding.

We are closely coordinating the development of the 07-09 plan with the work of the Puget Sound Partnership. We expect that the Partnership's 2020 agenda recommendations will add significantly to the state agency work put forward in this draft plan. In the final plan we will integrate as many of the substantive recommendations of the 2020 agenda developed by the Puget Sound Partnership as possible, where they apply to work needed in the 07-09 biennium.

The governor's initiative is a response to continuing declines in the health of Puget Sound, evidenced by events such as the listing of Puget Sound salmon and orca species as threatened with extinction. The Action Team's 2004 *State of the Sound Report* outlined a number of problem areas in the Sound and concluded that efforts to protect and restore the Sound have not kept pace with the impacts of growth. The report warned that if we do not scale up our efforts, we may lose the Puget Sound ecosystem, one of our state's greatest treasures.

Within the section on each of our priorities, we have included a subsection highlighting some potential actions for consideration by the Puget Sound Partnership. We will share whatever input we receive in developing this plan with the Puget Sound Partnership. If the Partnership decides to move on these and/or other recommendations, and there is a role for the Action Team agencies in 2007-2009, they will be incorporated into the final version of this plan. (More information on the Puget Sound Partnership is available at www.pugetsoundpartnership.org)

How the Action Team will use public comments

Public comments on the draft *2007-2009 Puget Sound Conservation and Recovery Plan* will provide input to Action Team agencies for the state's planning process for the next two-year budget period. The agencies will use public comments to revise the priorities, strategies and results, and during the summer of 2006 will develop internal work plans and budgets for the next biennium around those final strategies and results. Although broader agency responsibilities, legal mandates, and budget constraints also shape agency planning, agencies will use public comment to finalize the 07-09 Puget Sound plan. In December 2006, the Action Team will deliver a proposed 2007-2009 Puget Sound plan to the governor and the legislature for consideration as they develop the

two-year budget. After the budget is approved, the Action Team will produce a final plan for 2007-2009 based on the final budget.

For each priority, the plan includes long-term environmental goals that represent a significant resolution of the problem. The strategies for each priority are the key approaches the partnership will use to achieve progress during the two-year period. Action Team agencies have proposed results under each strategy that will achieve measurable progress and will align with agency work plans and proposed agency budgets. The final 2007-2009 plan will include results that the Action Team will report on and make adjustments as needed to achieve progress during the next biennium.

How to comment on the 2007-2009 Puget Sound Plan

Each priority section provides an overview of the issue and background on the more significant activities and programs the Action Team agencies are taking to address them. Some of the proposed results have measurable targets. Others will have targets assigned when agencies develop their proposed budgets in more detail. Lead or reporting agencies are identified for each result.

Each priority and strategic approach is based on a foundation of scientific information developed from analyzing years of data to identify trends and problems, as well as concerns and issues that have emerged in recent data and research. Much of that scientific information can be found in two summary documents, the *State of the Sound* (PSAT, 2004) and *Proceedings of the 2005 Georgia Basin/Puget Sound Research Conference.* Both of these documents and references to other scientific information are available on the Action Team Web site at www.psat.wa.gov

The Action Team encourages commenters to consider the following questions in responding to this document:

- Are these the right priorities? Are any more important than others?
- What is working and not working in our efforts to protect and restore Puget Sound?
- Are there any key priorities missing, from your perspective?
- Where are there opportunities for progress in a priority area?
- Are the strategies listed the best approaches, or should other strategies be added?
- Which results are most important to achieve by June 2009?
- Are there results or targets that should be added?
- What are some of the key obstacles to progress for specific priorities and activities?
- What activities will best achieve these results?
- Given the programs and activities currently underway, what are the most important next steps?
- How should the agencies measure progress on the priorities?
- What actions are needed on the local level to achieve progress, and how can the state support those needs?

The Action Team and Council look forward to hearing from you as we develop the 2007-2009 plan for Puget Sound, and as we continue our work together into the next biennium and beyond to protect and conserve the unique and rich resources of the Sound for future generations.

Priority 1: Clean up contaminated sites and sediments

In 2003, the City of Tacoma restored the Tahoma Salt Marsh by excavating more than 6,000 cubic yards of contaminated soil and then created a bowl-shaped salt marsh and upland area, and restored riparian habitat. | *City of Tacoma*

Long-term goal: All sediments exceeding state standards for contamination are cleaned up.

The issue

Over the past 100 years, human activities around Puget Sound have introduced a wide array of chemicals into the environment that cause health problems for humans, plants and animals. The more persistent chemicals have accumulated in the sediments of the Sound and from there have spread to accumulate in tissues of living organisms in the aquatic food web. Many types of fish as well as seals and orcas now show elevated levels of toxic contamination. Department of Health advisories to limit consumption of fish and shellfish from the Sound are increasing. Recent efforts include a fish consumption advisory for the Lower Duwamish River to address some of the highest polycholorinated byphenyl (PCB) levels observed in Washington State fish.

Some present day activities continue to release toxic chemicals such as polyaromatic hydrocarbons (PAHs from petroleum products), dioxins and mercury. However, current pollution control practices are far better than they were before existing environmental laws came into force. Most contaminated sites and sediments are the legacy of 100 years of uncontrolled or poorly controlled dumping and discharges to the upland, groundwater and submerged lands of the Puget Sound basin.

Contaminated sites on land are widely scattered because operations that caused the contamination were oil storage facilities, dry cleaners, creosote plants, and other activities that are located in many communities. Contaminated underwater sites in submerged lands are concentrated in the major urban bays, including Commencement Bay, Elliott Bay, Bellingham Bay, Sinclair Inlet, and other areas with extensive histories of industrial activities.

Today, large portions of Puget Sound's 1.8 million acres of submerged sediments show some form of chemical or biological degradation. The Department of Ecology (Ecology) has identified more than 5000 acres as contaminated. Some of the contaminated acreage may recover naturally without cleanup if the sources of contamination are controlled, but the majority is scheduled for cleanup activities.

Partners in cleaning up contaminated sites and sediments

Ecology manages each site as it moves through the stages of the cleanup process. In some cases, no responsible party is identified or able to fund the cleanup, and those sites are designated as orphan sites. The state departments of Natural Resources (DNR), Transportation, and Fish and Wildlife, as well as ports and local governments clean up these orphan sites and sites on public lands.

State laws important to this process include the 1988 comprehensive testing requirements and limits on the disposal of dredged material at open water sites. These standards were developed in the Dredged Materials Management Program, a cooperative program of Ecology, DNR, the United States Environmental Protection Agency (EPA), and the United States Army Corps of Engineers (ACOE). Other laws include the 1989 Model Toxics Control Act to govern site cleanups, and the 1991 comprehensive sediment management standards for Puget Sound.

Ecology is the state's lead agency in site cleanup, and administers the state's sediment management standards. EPA is the federal lead agency for site cleanups under the Comprehensive Environmental Response, Compensation and Liability Act (CERCLA). Ecology and EPA focus resources on cleaning up the "worst sites first" to remove the greatest risks to public health and the environment. To date, EPA has addressed over 700 acres of contaminated sediments and Ecology has addressed over 150 acres of contaminated sediments in Puget Sound.

Opportunities for the Puget Sound Partnership for 2007-2009

The Puget Sound Partnership (see page 2) is charged with developing recommendations for a 2020 agenda that is expected to ramp up and significantly add to the overall state agency efforts put forward in this draft public review 07-09 plan. The potential activities proposed below are intended to generate input on how we might best accelerate progress in cleaning up contaminated sites and sediments. The Puget Sound Partnership will hold forums on these and other topics during April and May of 2006. We anticipate draft recommendations on some of these topics in June, followed by more public forums in the summer. For more information go to www.pugetsoundpartnership.org.

Continue accelerated clean up of sites: In the 2005-2007 Puget Sound Plan, the Action Team identified the need to accelerate the slow pace of cleanups and fund cleanups of orphan sites to achieve progress on this priority. Recognizing the need to address the ongoing contamination of the food web through existing sites, Governor Gregoire requested and the 2006 legislature approved funding to accelerate site clean up in Bellingham Bay and Commencement Bay and to focus clean up efforts on sites within one-half mile of the Puget Sound shoreline. Other funding will begin a concerted cleanup effort for some orphan sites on state-owned aquatic lands. While these cleanup activities will begin before the 2007 biennium, they will be continued during the 2007-2009 budget period. Maintaining funding for this accelerated pace of cleanup is an important challenge for the 2007-2009 budget period.

Prevent impacts from recontamination: Another challenge during the next biennium is managing sites that have been cleaned up in order to prevent, detect and correct any recontamination of the site from ongoing toxic pollution. Ecology, EPA and others will continue to monitor cleaned up sites and to identify and address causes of recontamination. Each remediation project should include plans for appropriate source controls to prevent recontamination. Activities discussed under the toxics and stormwater priorities (see pages 7 and 12) are linked to preventing, detecting and correcting sources of recontamination, including biological disturbances to previously capped or unconfined disposal sites.

Link site cleanups to species recovery: The species at risk in Puget Sound can be helped by cleaning up contaminated sites with the greatest impacts on the aquatic food web. Options include developing criteria for assessing the risk that sediment and upland contaminated sites pose to orcas and other species at risk and using those criteria in giving grants for cleanup. Another

approach is to review known sediment and shoreline sites where remediation hasn't been started for their risk to orcas and initiating the process for sites that appear to pose the greatest risk.

Proposed 2007-2009 strategies for cleaning up contaminated sites and sediments.

1. Continue to identify and clean up contaminated sites.
2. Monitor completed cleanups to verify success and to detect and stop any recontamination.
3. Manage navigation dredging operations to clean up contaminated areas whenever possible and prevent contamination of unconfined disposal sites.

Proposed 2007-2009 results for cleaning up contaminated sites and sediments.

1. Continue to identify and clean up contaminated sites.
    a. The total number of upland and aquatic sites that are remediated under the authority of Ecology increases by ___ sites. (Ecology)
    b. Complete ___ corrective actions at state High Priority Hazardous Waste Facilities. (Ecology)
    c. ____ acres are evaluated to asses whether cleanup is needed. (Ecology)
2. Monitor completed cleanups to verify success and to detect and stop any recontamination.
3. Manage navigation dredging operations to clean up contaminated areas whenever possible and prevent contamination of unconfined disposal sites.

Priority 2: Prevent toxic contamination

Point Defiance in Tacoma becomes the staging area for bags of material used to clean up Dalco Passage Oil Spill, October 13, 2004. | *Photo by Kathy Taylor*

Long-term goal: Reduce and eventually eliminate the harm from toxic pollutants entering Puget Sound.

The issue

While cleaning up contaminated sites and sediments (see page 4) helps to correct the legacy of historic toxic contamination, this priority focuses on correcting ongoing contamination and preventing future contamination. Toxic contaminants continue to harm Puget Sound in the following key areas:

- Marine life in urban bays is harmed through continuing exposure to toxic organic and inorganic chemicals in the food web.
- Salmon and marine mammals have suppressed immune function due to exposure to some pesticides and persistent bioaccumulative toxins (PBTs).
- PBTs in Puget Sound fish pose an increasing concern for developmental effects in children.
- Humans who eat contaminated Puget Sound seafood put their health at risk.
- Marine populations have decreased viability.
- Shellfish accumulate toxic chemicals that can enter the food web.
- Marine birds and mammals can ingest toxic chemicals when they clean their feathers/coats damaged during oil spills.
- Risks from chemicals used in industry as well as from pharmaceuticals and personal care products are poorly understood.
- There are unknown risks from future releases.

In 2001, more than 879,000 pounds of toxic chemicals entered Puget Sound waters from industrial point sources. Similar figures from the approximately 50 sewage treatment plants that discharge roughly 600 million gallons per day of treated wastewater are not available. Another 7.7 million pounds of toxic chemicals entered the air in the Puget Sound basin from stationary sources (not including mobile sources such as cars or trucks). Air contaminants from global sources are also found in the Puget Sound region. The magnitude and geographic extent of ongoing toxic release into the basin is a significant threat to the system's long-term health.

As our population increases, it is likely that the flow of chemicals from households and businesses into our municipal sewage treatment plants will increase. Toxic compounds that are not completely removed by conventional wastewater treatment plants will reach the environment in greater quantities. These releases include a mixture of largely unstudied chemicals (from medicines, fragrances, creams, detergents and cleaners known as pharmaceuticals and personal care products) that pass though humans and our households,

into and through sewage treatment plants, and ultimately into the water and the aquatic food web.

Partners in preventing toxic contamination

Action Team partners are working to improve our ability to remove toxic substances at both the "end of the pipe" by treating and reclaiming wastewater and the "beginning of the pipe" in the production process and in consumer behaviors.

Washington State has a persistent bioaccumulative toxin (PBT) initiative through the Department of Ecology (Ecology), resulting in a mercury chemical action plan now being implemented in partnership with the Department of Health (Health). Ecology and Health have also completed a plan to reduce and phase-out the flame retardants (polybrominated diphenyl ethers) known as PBDEs that have been found in human breast milk and the marine food web. Efforts to ban PBTs are underway worldwide.

Ecology recently adopted the PBT regulation (Chapter 173-333 WAC). The rule contains a list of chemicals defined as PBTs, lays out a process to set priorities and schedule future chemical action plans and establishes procedures for developing these plans. Legislation passed in 2006 at Ecology's request establishes a program for manufacturers of certain electronic products to implement and finance recycling of electronic waste, one source of PBDEs and other toxic substances.

Ecology's approach to preventing toxic substances from entering the waste stream includes a technical assistance program for businesses to redesign their systems in order to reduce the production and use of toxic chemicals. The Technical Resources for Engineering Efficiency (TREE) program helps businesses increase efficiency, reduce supply costs, decrease hazardous waste disposal costs, and reduce toxic substances in the waste stream.

Ecology issues permits for municipal and industrial discharges under the National Pollutant Discharge Elimination System program. Water discharges by industries are a small fraction of toxic pollution compared to air emissions, and are generally decreasing. Ecology also works with communities that have municipal wastewater treatment plants to increase the volume of reclaimed wastewater for conservation and reuse, as well as to decrease the waste discharged to Puget Sound. Ecology and Health will work together to carry out 2006 legislation requiring that they develop and adopt rules for use of reclaimed water and greywater, and to determine the related permitting responsibilities for each agency.

Stormwater carries a significant amount of toxic pollutants, especially from air emissions deposited on land and from commercial areas and roads. Reducing the harm from stormwater runoff is a separate priority in this plan (see page 12).

Ecology's Spill Prevention, Preparedness and Response Program's efforts include ship inspections, marine terminal spill prevention plans and inspections, and administering the Neah Bay rescue tug that assists disabled vessels. Spill preparedness initiatives include regional response planning, oil spill preparedness drills and multi-agency training. The program is also the state's lead agency for providing around-the-clock assistance to oil and hazardous material spills. The 2006 legislature adopted more protective standards for oil transfer operations at Ecology's request. The Oil Spill Advisory Council in the Governor's Office will issue recommendations in September 2006.

The Washington Department of Agriculture (WSDA) works with the agricultural community to develop and implement integrated pest management plans and collects waste pesticides and other hazardous materials to ensure safe disposal. Individual citizen behaviors contribute

toxic substances to the environment through poor vehicle and boater maintenance, landscaping practices, and disposal of some household products through onsite sewage systems. The Action Team staff, Ecology, Health, Washington Sea Grant Program, Washington State University Extension and others conduct education and involvement activities to change behaviors and reduce this source of contamination. Partners in local governments and non-profit organizations in Puget Sound communities promote and reward sustainable business practices.

Opportunities for the Puget Sound Partnership for 2007-2009

The Puget Sound Partnership (see page 2) is charged with developing recommendations for a 2020 agenda that is expected to ramp up and significantly add to the overall state agency efforts put forward in this draft public review 07-09 plan. The potential activities proposed below are intended to generate input on how we might best accelerate progress in preventing toxic contamination. The Puget Sound Partnership will hold forums on these and other topics during April and May of 2006. We anticipate draft recommendations on some of these topics in June, followed by more public forums in the summer. For more information go to www.pugetsoundpartnership.org.

- Develop and implement Water Quality Improvement Plans for specific toxics in areas of Puget Sound where water quality standards are not being met.
- Revise state water quality standards and the mixing zones policy to ensure protection from harm to the most sensitive lifestages and organisms.
- Review and update what constitutes the most appropriate technologies for use in wastewater treatment.
- Investigate new technologies for removing toxic contaminants from wastewater, including contaminants from pharmaceuticals and personal care products, under a long-term strategy to upgrade wastewater treatment plants.
- Find state-level alternatives to national toxics policies determined to be inadequate to protect Puget Sound, such as enhanced product labeling.
- Ramp up technical assistance to businesses in the Puget Sound area on how to reduce toxic contaminants.
- Explore the feasibility of adding requirements to vehicle emission and/or safety inspections to control vehicle leaks of oil and other toxic substances, and other means of control to reduce the release of contaminants from brake and tire wear.
- Increase efforts to reclaim and reuse wastewater and stormwater.
- Develop a green business certification and education program.
- Promote and initiate "take-back" programs in local communities and with pharmacies and hospitals for pharmaceuticals and personal care products.
- Develop permanent funding sources for stationing a year-round rescue tug at Neah Bay.
- Improve our knowledge of the cumulative and synergistic effects of toxic contaminants.

Proposed 2007-2009 strategies for preventing toxic contamination.

1. Reduce the use and generation of toxic chemicals.
2. Reduce the release of toxic chemicals to the environment.
3. Improve spill prevention and response.

4. Educate residents to change behaviors to reduce toxic contamination.
5. Study toxics in Puget Sound.

Proposed 2007-2009 results for preventing toxic contamination

1. Reduce the use and generation of toxic chemicals.
   a. ___ percent or ___pounds of total amount of mercury reductions is achieved through voluntary programs, pollution prevention planning, regulatory requirements and other innovative efforts. (Health and Ecology)
   b. Use of deca-BDE (a flame retardant) by Washington manufacturers is reduced through voluntary changes to safe and effective alternatives. (Ecology)
   c. A PBT chemical action plan for ___ is completed and is being implemented. (Ecology—PBT chemical to be determined in September 2006)
   d. Chemical action plans for two Puget Sound contaminants of concern are initiated during the 2007-09 biennium. (Ecology)
   e. _____ industrial facilities receive engineering or other technical assistance to suggest quantifiable reductions in toxics use. (Ecology)
   f. By December 2007, publish a "Reducing Toxics Threats" Chemical Policy Task Force Report on the need for a future chemicals management policy, including addressing consumer products, producer responsibility issues, and promotion of "green" chemistry science and technology. (Ecology)
2. Reduce the release of toxic chemicals to the environment.
   a. Diesel emissions in Puget Sound basin are reduced by __ percent over the 2006 baseline. (Ecology)
   b. Amount of reclaimed water in Puget Sound increases by 2 million gallons per day or by ____ percent during the course of the biennium. (Ecology—may require additional resources)
   c. ___ pounds of unusable, cancelled or suspended pesticides are collected in events in the Puget Sound basin. (WSDA)
   d. 90 percent of NPDES permits for municipal sewage treatment plants have been issued within the past five years. (Ecology)
   e. 90 percent of NPDES permits for industrial facilities have been issued within the past five years. (Ecology)
3. Improve spill prevention and response.
   a. The number of 25 to 10,000 gallon spills decreases to __ and the volume of oil reaching surface waters from these spills decreases to _____ gallons. (Ecology)
   b. The percent of large commercial vessels having incidents that can lead to oil spills is reduced by 5 percent. (Ecology)
   c. Ecology responds to ____ of all incidents as soon as possible but not later than within 24 hours of their being reported to Ecology. "Incidents" refer to such occurrences as propulsion losses, steering failures, collisions, structural failures, fires or spills.
   d. Conduct ___ oil transfer inspections. (Ecology)
   e. The Oil Spill Advisory Council recommendations that are approved by the legislature and funded are implemented. (Ecology)

f. All Oil Spill Early Action Task Force recommendations that are approved by the legislature and funded are implemented by Ecology, if the recommendations are not all implemented before July 2007. (Ecology)

g. ___ grants are awarded to local and tribal governments to establish oil spill equipment caches in areas at high risk of oil spills, and to protect sensitive areas. (Ecology)

h. Local and tribal governments and Marine Resource Committees are involved in the development of oil spill Geographic Response Plans. (Ecology)

4. Educate residents to change behaviors to reduce toxic contamination.

a. Eight marinas reached with Sea Grant spill prevention education will achieve NOAA Clean Marina status.

b. Provide 30 Puget Sound shellfish growers with spill prevention and preparedness education and training. (Sea Grant)

c. 50 commercial fishermen receive spill prevention outreach aimed at eliminating fuel spills and bilge discharges. (Sea Grant)

d. Agricultural users receive education on pesticide application to minimize adverse environmental impacts. (WSDA)

e. 500 homeowners will adopt least toxic cleaning alternative practices and demonstrate scientific literacy in reading commercially available product labels. (Sea Grant)

f. Local "take-back" programs for pharmaceuticals and personal care products expand based on recommendations from King County program to be initiated in 2006. (PSAT)

g. A region-wide social marketing program is conducted to encourage changes in people's behavior to reduce toxics, and comprehensive interagency pollution prevention messages are developed. (PSAT)

5. Study toxics in Puget Sound.

a. A characterization of the status and trends of toxic contamination and their effects in the Puget Sound ecosystem is coordinated, with newly identified contaminants of concern included in the characterization. (PSAMP and PSAT, U.S. Fish and Wildlife Service)

b. A model to simulate contaminant loading, distribution, and food web accumulation and effects is developed to evaluate and support decisions about toxic reduction. (PSAT staff proposal for collaborative effort led by NOAA, USGS, EPA, PSAT or other lead entity.)

Priority 3: Reduce the harm from stormwater runoff

Bioretention facilities alongside streets capture runoff and prevent pollution from entering the Sound through stormwater systems. | *Photo by Bruce Wulkan*

Long-term goal: Improve management of stormwater runoff and reduce combined sewer overflows to meet water quality standards in all waters of the basin.

The issue

Stormwater runoff presents a high risk to the health of Puget Sound. Two species of salmon and bull trout are listed as threatened under the federal Endangered Species Act, and loss of habitat due to stormwater is one factor limiting recovery. In many shellfish growing areas, stormwater runoff contributes to harvest restrictions or closures. Many state waters fail to meet water quality standards in part due to stormwater. The U.S. Environmental Protection Agency cites stormwater runoff as one of the greatest threats to the health of the nation's waters.

Stormwater runoff causes two major problems. First, it transports a mixture of pollutants from roads, parking lots, lawns, and other developed lands to the Sound, degrading water quality and harming species as it moves throughout the food web. Pollutants include toxic petroleum products and heavy metals from vehicles and industries, fertilizers and pesticides from homes and farms, animal wastes, and sediment from construction sites. In older areas of the basin, stormwater carried in storm drainage systems is discharged with little or no water quality treatment. In areas with combined sanitary and storm sewers, during heavy rains a mixture of stormwater and raw sewage can spill into the Sound in events called combined sewer overflows (CSOs).

The second major problem is that during the wet season, the volume and peak flow of runoff increases dramatically. This effect is greater where development has hardened the land surface and stormwater is collected and conveyed to receiving waters in piped systems. High volumes can greatly alter and damage fish and wildlife habitat and can increase flooding in areas downstream. Improving stormwater management to protect habitat is especially important as state agencies and Puget Sound watersheds carry out actions to recover threatened species in the Puget Sound salmon recovery plans.

This risk to the Sound is magnified by predicted population growth and the limitations of current stormwater practices to fully manage the effects of development. Traditional development practices have led to significant loss of forest cover and increases in impervious surfaces. To protect Puget Sound, state and local governments and increasing numbers of developers are placing greater emphasis on innovative low impact development (LID) practices and other cost-effective solutions for new developments, and on retrofitting outdated stormwater facilities.

Partners in preventing harm from stormwater runoff

Ecology issues and oversees general stormwater permits for industrial, municipal and construction activities under the National Pollutant Discharge Elimination System (NPDES) mandated by the federal Clean Water Act. A revised general construction permit was issued and subsequently appealed. A general municipal permit will cover an anticipated 76 smaller cities and towns in Puget Sound and smaller construction sites under Phase II permits scheduled to be issued in 2006. An additional five local governments will be covered by a reissued Phase I municipal general permit. Technical assistance, guidance, and some funding is available from Ecology, Puget Sound Action Team (Action Team) and the departments of Fish and Wildlife and Community, Trade and Economic Development. An updated general industrial permit is scheduled to be issued in September 2007.

In Puget Sound, 10 jurisdictions are still working to reduce the number and volume of CSO events. Ecology oversees each local government's reduction plan and administers the state revolving fund loans used to correct and retrofit systems so as to reduce overflows of untreated sewage during heavy rainstorms.

The Action Team staff works with all Puget Sound local governments to adopt the local comprehensive stormwater program from the *Puget Sound Water Quality Management Plan*. The local comprehensive program includes all of the minimum requirements of Phase II NPDES permits as well as several additional elements to protect habitat and water quality, such as identifying and ranking existing problems and conducting environmental and programmatic monitoring.

One element of the comprehensive program is promoting the use of innovative LID measures. Action Team staff, Ecology, WSU Extension, Washington Department of Transportation (WSDOT), conservation districts, local governments and others in academia and the private sector are providing funding, support, technical assistance, education and research to increase information and projects in Puget Sound. Projects using this innovative approach preserve native vegetation and soils, reduce and disconnect impervious surfaces, and use small-scale controls at a site level to manage, treat and where appropriate, infiltrate stormwater runoff. As more local governments amend regulations to encourage or require these practices, there are increasing numbers of cost-effective, on-the-ground projects that demonstrate success in reducing the environmental effects of development.

WSDOT manages stormwater from state highways according to requirements in their NPDES permit and an updated highway runoff manual. WSDOT is an important partner in preventing harm from stormwater runoff because highways comprise significant paved surfaces in the state and these surfaces can transport pollutants from vehicles if the stormwater is not adequately treated. WSDOT also plays an important role in managing erosion and sediment at highway construction site projects.

Opportunities for the Puget Sound Partnership in 2007-2009

The Puget Sound Partnership (see page 2) is charged with developing recommendations for a 2020 agenda that is expected to ramp up and significantly add to the overall state agency efforts put forward in this draft public review 07-09 plan. The potential activities proposed below are intended to generate input on how we might best accelerate progress in preventing harm from stormwater runoff. The Puget Sound Partnership will hold forums on these and other topics during April and May of 2006. We anticipate draft recommendations on some of these topics in June,

followed by more public forums in the summer. For more information go to www.pugetsoundpartnership.org

Better preserve native vegetation and limit impervious surfaces: The single most effective and cost-effective tool to manage stormwater runoff is to preserve native vegetation and limit impervious surface. The greatest opportunity for the partnership lies in taking action to help accomplish this. This could be accomplished by using a variety of tools, such as land use planning under the Growth Management Act, watershed and basin planning, low impact development, land acquisition, and conservation easements. (See habitat protection priority, page 28.)

Help fund local stormwater program development and infrastructure retrofits: An anticipated 81 local governments will be implementing requirements of NPDES permits during the next biennium, and many local governments will struggle to meet permit requirements. There is a need for additional funding to Puget Sound local governments to help pay for developing programs and retrofitting existing, outdated infrastructure. Additional assistance could be expanded beyond the permitted jurisdictions. More than 40 cities and towns and the vast majority of the land area of the Puget Sound counties (other than NPDES Phase I counties) are not covered by the permit. Much of this land area has valuable fish and wildlife habitat that must be protected in order to recover threatened salmon and other species at risk.

Help fund LID projects: Opportunities exist to make LID the first approach considered when developing land and managing stormwater runoff. The 2006 legislature approved a request from the governor for supplemental funding for new grants to local governments for innovative stormwater LID projects. This financial assistance will help ensure that LID techniques are used in a number of local municipal projects and performance monitoring will provide a quantitative measure of their effectiveness. Extending the life of this one-time grant program and expanding it to the private sector would provide incentives to add LID techniques to additional planned projects.

Help remove local barriers to LID: The Puget Sound Partnership could make additional resources available for local and tribal governments to remove regulatory barriers to the use of LID. Because LID is a relatively new set of management tools, additional training for local government staff, the development community, and private sector consultants could help ensure that LID is done correctly.

Develop a comprehensive monitoring program: It is critical that we understand the effects of stormwater runoff on aquatic systems and evaluate the effectiveness of management programs and individual practices in order to develop and refine programs to prevent harm from stormwater runoff. The Puget Sound Partnership can consider support for developing and beginning to carry out such a monitoring program. This program would help achieve progress on the priorities for preventing impacts from recontamination of sediment cleanup sites, and preventing toxic contamination.

Increase funding for small acreage landowner technical assistance programs: The fastest growing clientele for most Puget Sound conservation districts are owners of smaller acreages that are dealing with the effects of stormwater on their properties. Increased resources for technical assistance to these landowners would help them understand the connections between their land management practices and the resource.

Proposed 2007-2009 strategies for preventing harm from stormwater runoff.

1. Bring permittees into compliance with requirements of NPDES general stormwater permits.

2. Bring Puget Sound jurisdictions both inside and outside of the NPDES permit processes into compliance with the Puget Sound comprehensive stormwater management program.
3. Increase the use of LID techniques where appropriate, and help ensure that the LID approach is the first, preferred option considered to develop land and manage stormwater.
4. Manage runoff from state highways according to an updated highway runoff manual, retrofit existing facilities and monitor management practices.
5. Continue to reduce the number and volume of CSO events.
6. Develop and begin to implement a Soundwide monitoring program to better understand the impacts of stormwater runoff on Puget Sound and the effectiveness of management practices.
7. Increase small acreage landowner technical assistance and voluntary incentive programs.
8. Educate and involve the public in preventing harm from stormwater runoff.

Proposed 2007-2009 results for preventing harm from stormwater runoff.

Environmental Result: Improve water quality that is impaired by stormwater

a. At least one shellfish growing area threatened or degraded by stormwater runoff is upgraded or protected. (Health, PSAT, Ecology)

1. Bring permittees into compliance with requirements of NPDES general stormwater permits.
   a. ___ percent of NPDES municipal general permittees receive technical assistance to help them comply with the permits. (Ecology)
   b. The NPDES general industrial stormwater permit is reissued by September 2007. (Ecology)
   c. Ecology staff carry out an average of one stormwater inspection every two years at ___ construction sites. (Ecology)
   d. Ecology staff carry out an average of one stormwater inspection every two years at ___ industrial facilities. (Ecology)
2. Bring Puget Sound jurisdictions both inside and outside of the NPDES permit processes into compliance with the comprehensive stormwater program called for in the *Puget Sound Water Quality Management Plan*.
   a. The number of local governments adopting the elements of the Puget Sound comprehensive local stormwater management programs increases by __ percent during the biennium. (PSAT)
   b. Assistance is provided to ___ jurisdictions to help them develop comprehensive stormwater programs and link salmon recovery efforts, land use planning, and watershed planning to stormwater programs. (PSAT)
3. Increase the use of LID techniques where appropriate and help ensure that the LID approach is the first, preferred option considered to develop land and manage stormwater.
   a. Four local governments adopt or revise regulations to allow for or encourage the use of LID techniques. (PSAT)
   b. LID projects are completed by local governments, as part of the 2006 supplemental budget grant program. (Ecology will report on projects from 2006 supplemental funding completed after July 1, 2007)
   c. The LID Technical Guidance Manual for Puget Sound is updated, based on

monitoring results and research. (PSAT, WSU Extension)

d. Additional LID training is made available to local government staff, the development community, consultants and others. (PSAT staff, WSU Extension—requires additional funding)

4. Manage runoff from state highways according to an updated highway runoff manual, retrofit existing facilities and monitor management practices.
   a. Of construction sites considered to be the highest risk to cause pollution, attain 90 percent compliance with all 13 erosion and sediment control assessment measures. (WSDOT)
   b. ___ stormwater retrofits for existing impervious surfaces are completed on prioritized outfalls from a state highways where high-volume traffic drains to sensitive water bodies. (WSDOT)
   c. Runoff treatment and flow-control best management practices to mitigate the impacts of new impervious surface are implemented as part of transportation construction projects. (WSDOT)
   d. __ stormwater outfalls and tributary conveyances will be identified and mapped as part of compliance with the NPDES permit. (WSDOT)
5. Continue to reduce the number and volume of CSO events to Puget Sound.
   a. ____ percent of the 10 Puget Sound jurisdictions with CSOs meet the milestones in their CSO-reduction plans. (Ecology)
6. Develop and begin to implement a Soundwide monitoring program to better understand the impacts of stormwater runoff on Puget Sound and the effectiveness of management practices.
   a. A comprehensive monitoring program is cooperatively developed by a broad-based committee by _____. (PSAT—requires additional funding)
   b. An ongoing facility is established by _____ (date) to test and research the relative effectiveness of best management practices. (PSAT—requires additional funding)
   c. All stormwater outfalls on or adjacent to aquatic lands are identified by a date amenable to Ecology. (DNR)
   d. Increased exchange of information and protocols between 125 researchers and practitioners through a Puget Sound LID stormwater monitoring forum. (WSU Extension)
7. Increase small acreage landowner technical assistance and voluntary incentive programs.
   a. ____ private small acreage landowners receive technical assistance from conservation districts to prevent stormwater runoff from their properties. (Conservation Commission—requires additional funding)
   b. ____private small acreage landowners implement best management practices to prevent stormwater runoff from their properties. (Conservation Commission—requires additional funding)
8. Educate and involve the public in preventing harm from stormwater runoff.
   a. At least 10,000 homeowners, vehicle owners, members of the real estate and development community, and state, tribal and local government staff increase their knowledge, skills and motivation to change behaviors and

practices to reduce contamination and volume of stormwater runoff. This will include awarding 15,000 clock hours to real estate professionals. (WSU Extension)

b. _____percent of local governments will provide public education and involvement opportunities to citizens. (PSAT)

Priority 4: Prevent nutrient and pathogen pollution

Workers retrofit an existing septic system on a Hood Canal property. | *Photo by Terry Hull*

Long-term goal: Reduce nutrient and pathogen pollution to meet water quality standards and protect public health in all Puget Sound waters.

The issue

Puget Sound's marine and fresh waters are vulnerable to nutrient and pathogen pollution from an array of human and animal sources, including municipal sewage treatment plants; onsite sewage systems; stormwater runoff and combined sewer overflows; agricultural, forest and landscaping practices; ship/boater discharges; pet waste; and wildlife. Nutrients in excessive concentrations can cause algal blooms that take up oxygen when they die, an imbalance of the food web that reduces the oxygen available to aquatic life. This is the condition that led the Action Team partners to place a special focus on Hood Canal, where extremely low oxygen levels led to fish die-offs in recent years (see page 24). In addition to Hood Canal, Puget Sound has other areas such as South Sound and Whidbey Basin that are particularly susceptible to nutrient pollution.

Pathogens such as bacteria and viruses can contaminate shellfish beds, swimming beaches, and other water resources, and harm humans, aquatic life and ecosystem functions. Pathogen pollution in some areas of Puget Sound exceeds water quality standards.

Clean water is particularly important to the abundant shellfish resources of Puget Sound and to preserving Washington State's position as the nation's leading producer of farmed bivalve shellfish. Shellfish resources are a significant cultural and economic resource for Puget Sound tribes and also provide a recreational asset enjoyed by other residents of the region and by tourists who contribute to the state's economy. An estimated 165,000 acres of total acreage in Puget Sound is classified by the Department of Health (Health) for harvest. Out of that total, approximately 28,000 acres of shellfish beds in Puget Sound remain restricted or prohibited for commercial and recreational harvest.

Research indicates that pathogen and nutrient pollution is closely associated with the region's large and fast-growing population and rapidly urbanizing landscape. In recent decades, updated municipal sewage treatment plants dramatically lowered the concentration of many conventional pollutants discharged to Puget Sound. However, population growth and higher discharge volumes have offset some of these gains, and some pollutants—including nutrients—have received limited attention. Residents living outside urban areas are served by an estimated half-million onsite sewage systems that can contaminate Puget Sound if they do not provide effective treatment and are not managed to prevent failures.

Livestock and pet wastes contribute to nutrient and pathogen pollution when not properly

managed. Some commercial livestock operations are covered under the state dairy nutrient management program or the water quality permit program. Thousands of smaller and non-commercial operations are not regulated and may lack effective management practices. In addition, fertilizers applied in agriculture, forestry or landscaping include nutrients carried to streams and marine waters in surface and stormwater runoff. Some nutrients infiltrate to reach groundwater and can impair drinking water supplies in areas relying on wells.

Dramatic increases in passenger ship traffic raise questions about wastewater discharges, treatment methods, and potential impacts associated with these vessels. A companion concern—discharges from the nearly 180,000 registered boats in the region—underscores the continued need for accessible and functional boat pumpout facilities and consideration of more carefully regulated discharge zones.

Partners in preventing nutrient and pathogen pollution

Health monitors and classifies shellfish growing areas and supports water quality restoration activities when they are threatened with or closed to harvest. Health, the Department of Ecology (Ecology), the Department of Agriculture (WSDA) and Action Team staff support local shellfish restoration efforts of local governments, farmers, shellfish growers, tribes and others.

Health works with local health authorities to develop plans and programs to manage and regulate onsite sewage systems. As the region's population grows, the legislature, the State Board of Health and state agencies are increasing support and requirements for management programs that focus efforts on more complicated onsite sewage systems and in high-risk areas with poor soil conditions or fragile resources. Health also reviews and approves new technologies to help ensure that the performance of onsite sewage systems is appropriately matched to site conditions. Health works with Ecology to regulate larger onsite sewage systems that serve multi-home communities. Legislation passed in 2006 requires Puget Sound local health authorities to identify and develop management plans for marine recovery areas where onsite sewage systems contribute to water quality problems, and directs Ecology to provide financial and technical assistance to local and tribal governments to fund expanded loan and grant programs for system replacement and repair.

Ecology issues permits and monitors the performance of sewage treatment plants under the National Pollutant Discharge Elimination System (NPDES) mandated by the federal Clean Water Act. Ecology monitors discharges from large passenger ships under the terms of a memorandum of understanding with the industry. Health is undertaking studies to assess the need for shellfish closure zones around passenger ships.

Ecology is required under the Clean Water Act to develop water cleanup plans for waters that do not meet state water quality standards. Ecology, with state and local partners, is developing plans that address nutrients, dissolved oxygen, and fecal coliform. The plans, known as Water Quality Improvement plans, include actions different parties will take to reduce pollution. The agency provides funding to help translate these plans into on-the-ground actions. Ecology also administers grant and loan funds for projects throughout the Sound to improve water quality and to build or update sewage and stormwater infrastructure. Because a large portion of the pollution is from diffuse, scattered and small sources, Ecology and Action Team partners implement the state's plan to prevent and reduce this "nonpoint" pollution.

The WSDA administers the Dairy Nutrient Management Program that regulates licensed dairies through planning and site management

requirements, regular inspections and compliance assistance in preventing pollution. WSDA also responds to complaints about certain livestock operations and coordinates with Ecology on inspections of non-dairy animal feeding operations that are covered by the NPDES Concentrated Animal Feeding Operation (CAFO) permit program. The state Conservation Commission and conservation districts in each county educate landowners and provide voluntary and incentive programs to help landowners of small and large operations prevent pollution by managing animal waste.

The Washington State Parks and Recreation Commission (State Parks) provides public education and manages sewage disposal facilities at state parks. In addition, State Parks funds construction of pumpouts for disposal of boat sewage, and works with other educators to encourage boaters to use these facilities.

Regulatory programs help reduce pollution from many sources, but education and voluntary actions are critical to reducing sources of nutrient and pathogen pollution from individual homes, small farms and businesses across the basin. Washington Sea Grant program, Washington State University (WSU) Extension, Action Team staff, conservation districts and other state, tribal, local and federal partners work with local communities to offer alternatives and programs that change polluting behaviors.

Opportunities for the Puget Sound Partnership in 2007-2009

The Puget Sound Partnership (see page 2) is charged with developing recommendations for a 2020 agenda that is expected to ramp up and significantly add to the overall state agency efforts put forward in this draft public review 07-09 plan. The potential activities proposed below are intended to generate input on how we might best accelerate progress in preventing nutrient and pathogen pollution. The Puget Sound Partnership will hold forums on these and other topics during April and May of 2006. We anticipate draft recommendations on some of these topics in June, followed by more public forums in the summer. For more information go to www.pugetsoundpartnership.org

Ensure testing of public domain nitrogen-removing onsite sewage technology: The requirement for use of nitrogen-removing devices is expected to increase after July 2007 under the state Board of Health's revised rule. Onsite sewage system devices must be tested according to Health's protocol for listing by that agency to be approved for use. Without the resources to test non-proprietary systems, effective public domain technologies like the recirculating gravel filter are not likely to be approved for use.

Increase funding for local onsite sewage programs: Local health jurisdictions have increased responsibilities in Puget Sound to develop programs to manage onsite sewage systems in areas where failing systems contribute to water quality problems. Additional funding for local capacity is key to developing and supporting the programs.

Evaluate small passenger ship discharges: Large passenger ships control discharges of sewage and other wastewaters in accordance with a memorandum of understanding between the industry and Ecology. Small passsenger ship operators are not parties to this agreement. Their discharges should be characterized and evaluated to identify problems and solutions for more effective control.

Evaluate and establish "no-discharge" areas for recreational boaters: The Clean Water Act allows states to apply to the U.S. Environmental Protection Agency (EPA) to designate certain water bodies as "no-discharge" areas or zones for marine sanitation, where necessary to protect

sensitive aquatic environments. Areas of Puget Sound such as Hood Canal can be evaluated for this type of action.

Establish a long-term monitoring program to assess field performance of onsite sewage systems: Proprietary treatment devices are approved for use in the state by Health on the basis of standardized testing under controlled laboratory conditions. Limited field-testing indicates these devices perform far less well under the conditions of normal use.

Increase investment for small acreage best management practices: Survey data indicate a large increase in the number of small farms being created on small acreage parcels in rural areas, with a corresponding increase in non-point pollution. Additional resources would allow local conservation districts and WSU Extension to guide novice farmers toward more appropriate waste management.

Proposed 2007-2009 strategies to prevent nutrient and pathogen pollution

1. Focus efforts and resources in high-risk areas most vulnerable to the effects of pathogen and nutrient pollution.
2. Enhance state agency coordination and implementation of programs and projects.
3. Support effective and innovative implementation of regulatory and non-regulatory approaches.
4. Enhance the capacity of local jurisdictions to design and implement effective and comprehensive programs using a range of regulatory and non-regulatory approaches.
5. Educate and involve residents and others to enhance stewardship activities.
6. Enhance monitoring, modeling and other assessment activities to better understand the pollution problems and guide management activities.

Proposed 2007-2009 results to prevent nutrient and pathogen pollution

1. Focus efforts and resources in high-risk areas most vulnerable to the effects of pathogen and nutrient pollution.
   a. A net gain of ___ commercial shellfish acres based on improvements in water quality or pollution controls. (Health)
   b. Restoration projects are conducted at ___ commercial or recreational shellfish areas that are degraded or threatened. (Health)
   c. At least ___ shellfish growing areas degraded or threatened by discharges from concentrations of onsite sewage systems are upgraded or protected. (Health)
   d. Classification of all recreational beaches with an average use of greater than 500 harvesters per year is initiated over a three-year period. (Health)
   e. The percent of swimming beaches that exceed bacteria standards for safe swimming decreases over the biennium. (Ecology—may require additional funding).
2. Enhance state agency coordination and implementation of programs and projects.
   a. The volume of boater waste collected at pump outs, as a result of State Parks education and provision of pump out facilities, increases by __ percent during the biennium based on a current annual estimate of approximately ___ million gallons collected. (State Parks)
   b. __ boater waste facilities are installed or replaced in Puget Sound. (State Parks)
   c. Ecology completes an annual average total of ___ nutrient, dissolved oxygen, and fecal coliform focused Water Quality Improvement plans.

d. The performance status of systems is documented and the number of large onsite sewage systems in compliance with Health and Ecology operating permits is increased by __ percent. (Health)

e. New or repaired sewage facilities are constructed at ___ state parks, increasing to ___ the percentage of facilities that are in compliance with Health and Ecology operating permits. (State Parks)

f. At least __ percent of Puget Sound state parks have pet waste disposal stations installed to reduce pet waste. (State Parks)

g. The interagency Memorandum of Agreement guiding state agency responses to shellfish closures and threatened shellfish areas is updated. (Health, Ecology, PSAT, WSDA)

3. Support effective and innovative implementation of regulatory and non-regulatory approaches.

a. At least 80 percent of inspected Puget Sound dairies and 95 percent of permitted CAFO facilities are in compliance with state and federal water quality rules by the end of the biennium, as indicated by no need for follow-up inspections and no reported discharges. (WSDA)

a. Conservation districts approve and implement ___ best management practices on non-commercial livestock operations. (Conservation Commission)

b. Conservation districts approve and implement ___ best management practices on livestock operations that meet the definition of Animal Feeding Operations and CAFOs. (Conservation Commission)

c. Conservation districts complete ___ approved conservation plans. (Conservation Commission)

d. Comprehensive farm management training programs are provided for 250 small farm operators. (WSU Extension)

4. Enhance the capacity of local jurisdictions to design and implement effective and comprehensive programs using a range of regulatory and non-regulatory approaches.

a. ___ local health jurisdictions are implementing onsite sewage program management plans approved by Health. (Health)

b. The number of local health jurisdictions with the data available to inventory and map onsite sewage systems in priority marine areas increases from __ to ____. (Health)

5. Educate and involve residents and others to enhance stewardship activities.

a. Throughout Puget Sound, citizens engage in public education and involvement opportunities that change behavior and result in actions to reduce nutrient and pathogen pollution and to increase beneficial uses of state waters, including safe harvest of shellfish. (PSAT, WSU Extension)

b. ___ homeowners change their landscape practices to ensure that fertilizers applied to their yards do not migrate to surface waters. (Sea Grant, WSU Extension)

c. ____ homeowners will actively manage their tideland for shellfish culture thereby filtering nutrient-rich phytoplankton from the water column. (Sea Grant)

d. ___ tideland owners will monitor, record, quantify, and map the varieties of macroalgae and shellfish residing on their beaches. (Sea Grant)

e. ___ environmental health professionals, conservation district staff, and environmental educators will participate in continuing education trainings regarding pathogen and nutrient pollution. (Sea Grant)

6. Enhance monitoring, modeling and other assessment activities to better understand the pollution problems and guide the related management activities.

   a. The feasibility of allowing harvest in 18 geoduck tracts is evaluated based on assessment of sewage and stormwater outfall data and implementation of remedial strategies. (DNR, Health, Ecology)

   b. Additional monitoring data is collected and work is begun on a dissolved oxygen and nutrient model for south Puget Sound. (Ecology)

   c. Nutrient monitoring data is used to produce models for ___ priority areas. (Ecology)

Special Focus Area: The Hood Canal Low Dissolved Oxygen Problem

Looking northward toward Hood Canal. | *Photo by Terry Hull*

The issue

Hood Canal's deep marine waters are at serious risk from hypoxia, a lack of dissolved oxygen. This problem hit the spotlight in the spring of 2002 and again in the fall of 2003 when dead fish and other marine life washed up on Hood Canal beaches, having essentially suffocated. Hood Canal has had a history of low dissolved oxygen levels resulting in fish kills documented as far back as the early 1960s. However, monitoring data documented after the fish die-offs found the dissolved oxygen levels at their lowest in recorded history, and indicate that period of low oxygen lasted longer than did similar periods in the past. During 2004, the canal's oxygen levels were the lowest in recorded history.

In recent years the area of low dissolved oxygen has been getting larger, spreading northward from the great bend of the canal and the periods of low dissolved oxygen are lasting longer throughout the year.

Many natural factors may contribute to the low dissolved oxygen problem: slow water circulation and mixing, the incoming ocean water quality, changes in the weather, high growth of algae, loadings of carbon and nitrogen, and changes in the native marine life composition.

Human activities affect the dissolved oxygen concentration in several ways, including altering the river flows, landscapes, and marine life, and adding excess nutrients to the waters that can fuel extra algae growth that takes up oxygen when it dies. Finding the causes of the nutrient problem in Hood Canal and restoring water quality is important to save the aquatic life of a unique part of Puget Sound. Solutions for Hood Canal will also help to prevent and address low dissolved oxygen problems elsewhere in Puget Sound. As the basin's population increases, work in Hood Canal to address nutrient pollution and low dissolved oxygen problems may be used in other areas of Puget Sound. (See page 18.)

Partners in restoring Hood Canal water quality

The Hood Canal Dissolved Oxygen Program (HCDOP) is a partnership of 38 organizations that conducts monitoring, modeling and analysis and develops potential corrective actions to address the low dissolved oxygen problem in Hood Canal. The Puget Sound Action Team (Action Team) staff chair the HCDOP coordinating group and co-manage the corrective action and education component of the group with the Hood Canal Coordinating Council (HCCC). Action Team staff also coordinate a group of Action Team agencies that focus funding, technical assistance and other resources on supporting HCDOP efforts.

The HCDOP has three main areas of work: implementing early actions, developing scientific information to better determine the causes of the problem, and public education and involvement.

Action Team staff and the HCCC collaborated to produce the *Hood Canal Low Dissolved Oxygen Preliminary Assessment and Corrective Action Plan (PACA)* in May 2004. The plan identified the most likely primary human causes of nutrient pollution and the most feasible corrective actions or fixes to those human-caused problems. Federal and state funding initiated early action projects to address human-caused pollution in October 2004. Ecology, the Conservation Commission, the departments of Health (Health), Community, Trade and Economic Development (CTED) and other agencies provided technical assistance and advice for many of the projects. The legislature established the Hood Canal Aquatic Rehabilitation Zone in 2005. In 2006 new legislation created a Hood Canal Aquatic Rehabilitation Account for funding for projects and programs to protect and restore Hood Canal.

The HCDOP Integrated Assessment and Modeling Study is a three-year study to use marine, freshwater and biota monitoring data in developing a computer model. The model will quantify the role the various natural processes and human actions are playing to control the concentrations of dissolved oxygen in Hood Canal and will be used to test corrective action scenarios. Federal funding supports work by the U.S. Geological Survey and the University of Washington Applied Physics Laboratory for the study. The study is a collaboration among 17 organizations. Study results will be funneled to the Corrective Action and Education Program under the HCDOP to better target actions as the causes are better understood.

Ecology plays a critical role by implementing the Clean Water Act in state waters, including programs to permit discharges (National Pollutant Discharge Elimination System) and to develop water cleanup plans for waters with impaired water quality. Ecology is developing and applying water quality models to sensitive areas of the Sound to support regulatory programs and will fund (with matching funding from the U.S. Environmental Protection Agency (EPA)) its technical staff to develop a water quality model of Hood Canal. The desktop computer model will be a valuable tool for evaluating nutrient impacts on a short timeframe. Ecology will maintain the model over the long term and will develop it in collaboration with the 3-year HCDOP study. Ecology and other HCDOP partners are presently sharing and coordinating work on monitoring and modeling. When both models are operational, results can be compared to build more confidence in model representations and to identify areas of uncertainty.

The Hood Canal Watershed Education Network is a group of organizations that are conducting education and public involvement activities in the Hood Canal watershed. State agencies and Washington Sea Grant and Washington State University Extension play an integral role in this group. The Action Team staff host a Web site for information about Hood Canal's water quality problems and what people can do to help, and publish a quarterly electronic newsletter about Hood Canal in cooperation with the HCCC. Many of the HCDOP partners and other local organizations are working to build a citizen stewardship network to promote actions that reduce pollution.

Proposed 2007-2009 strategies for improving Hood Canal water quality

1. Coordinate partners working to correct Hood Canal's low dissolved oxygen problem.

2. Communicate information to the media, legislature and the public about the water quality problem and what the partnership is doing to fix the problem.
3. Improve the scientific understanding of Hood Canal and apply that understanding to solutions.
4. Carry out early actions to help fix water quality problems in Hood Canal.
5. Educate the public about the low dissolved oxygen problem in Hood Canal and engage them in activities to improve water quality.
6. Strengthen local governments' abilities to correct existing pollution problems and to deal effectively with the impacts of increasing populations.

Proposed 2007-2009 results for improving Hood Canal water quality

1. Coordinate partners working to correct Hood Canal's low dissolved oxygen problem.
   a. Science is used to inform corrective actions and to evaluate the effects of nutrient change on dissolved oxygen as coordinated by the HCDOP. (HCDOP partners, PSAT as state lead)
2. Communicate information to the media, legislature and the public about the water quality problem and what the partnership is doing to fix the problem.
   a. HCDOP works with the House Select Committee on Hood Canal to inform the legislature and the public about progress in restoring water quality in Hood Canal.
   b. The public is informed through eight quarterly newsletters, two Hood Canal Forums, and an updated Web site.
3. Improve the scientific understanding of Hood Canal and apply that understanding to solutions.
   a. _____ sub-watersheds are identified where new and replacement onsite sewage systems need to incorporate nitrogen removal.
   b. The scientific model of Hood Canal is verified and used to evaluate the effect of changed nutrient-source loading on the canal's dissolved oxygen.
4. Carry out early actions to help fix water quality problems in Hood Canal.
   a. Construction begins for a sewage treatment system(s) in Skokomish-Hoodsport corridor based on completed plans, design and available funds.
   b. Construction begins for a sewage treatment system for the Belfair service area.
   c. Shoreline surveys in Mason, Jefferson and Kitsap counties are completed, failing systems are identified, and 90 percent are repaired.
   d. Loan programs are in place in Mason, Jefferson and Kitsap counties to fix failing onsite sewage systems, and $500,000 in loans are disbursed.
   e. Construction is completed and operation started of the anaerobic digester to treat animal wastes and other organic material within the facility service area, based on the results of a feasibility study due in fall 2006.
   f. Stormwater management plans for Hoodsport and Belfair are completed

and initial actions are taken to implement recommendations of those plans.

g. Construction of wastewater system at Dosewallips State Park and three other Hood Canal state parks is begun.

h. Construction of the Hoodsport fish hatchery wastewater treatment system is complete and the mass loading of nitrogen from this hatchery is reduced by 75 percent.

5. Educate the public about the low dissolved oxygen problem in Hood Canal and engage them in activities to improve water quality.

   a. _____ communities around the canal construct cluster onsite sewage systems to replace failing individual systems and reduce nitrogen by ____ percent.

   b. 1,500 residents receive information about corrective actions in the Canal and resources to help them adopt behaviors that will protect the Canal. (WSU Extension, Sea Grant, PSAT)

   c. 1,000 residents actively participate in stewardship programs and adopt canal-friendly practices in managing their homes and landscapes. (WSU Extension)

7. Strengthen local governments' abilities to correct existing pollution problems and to deal effectively with the impacts of increasing populations.

   a. A program to manage onsite sewage systems is adopted and implemented by local health boards. (Mason, Jefferson and Kitsap counties)

   b. The findings of the 2005-2007 governance study are implemented. (HCCC)

   c. An assessment of the effect of projected growth over the next ___ years on the canal's nitrogen input and ultimately on dissolved oxygen. (HCDOP and the Integrated Assessment and Monitoring program, HCCC and local governments)

Priority 5: Protect functioning nearshore and freshwater habitats

Nisqually estuary saltmarsh in Thurston County. | *Photo by Brian Walsh*

Long-term goal: Preserve the ecological processes that create and maintain marine and freshwater habitats.

The issue

Puget Sound's population has doubled from 2 million to 4 million since 1960 and is projected to reach 5.4 million by 2025. Changes in the landscape from this growth include the loss of and damage to habitats for a number of species that are critical to the Puget Sound aquatic food web. Endangered Species Act listings of salmon and orca, the alarming declines in many other species, the list of polluted water bodies, the disappearance of nearshore habitats, the acres of closed shellfish harvest areas, and changes in streamflows and flooding patterns are evidence of the loss of habitats, habitat-forming processes and the functions they perform in the ecosystem.

In some parts of Puget Sound, the landscape is now urban. In areas of less urbanization there is increasing pressure to accommodate growth by altering remaining habitats. As growth continues, preserving functioning habitats and the associated ecological processes they support requires a combination of regulatory and voluntary approaches. Those efforts are connected to the work described under priority areas for restoring degraded habitats and for conserving and recovering species at risk. (See pages 34 and 37.)

In addition, aquatic nuisance species not native to the Sound can alter and destroy habitats and cause rapid and irreversible impacts to the ecosystem. The recent discovery of invasive colonial tunicates in areas of the Sound and the experiences of other major estuaries in the United States that have high population growth rates, a large boating community, and international port facilities are a reminder that it is imperative that Puget Sound prepare to respond to such events to protect the Sound's ecosystem.

Regulatory approaches to land use are necessary to protect public health and safety, public and private property, and public trust resources that benefit society and are needed to sustain future generations. Local governments achieve a regulatory approach to habitat protection in large part by implementing the state Growth Management Act and Shoreline Management Act. By July 1, 2007 almost all Puget Sound local governments will have completed critical areas ordinances updates. A number of Puget Sound jurisdictions will be revising regulations to meet requirements of Ecology's Shoreline Master Program (SMP) Guidelines, which were updated in 2004 to improve protections for shoreline ecological functions.

At the same time, local watersheds in Puget Sound are completing a period of significant watershed-based planning. Regional efforts funded in part by the state include Water Resources Inventory Area plans under the Watershed Planning Act, local watershed chapters of the *Draft Puget*

Sound Salmon Recovery Plan coordinated by the Puget Sound Shared Strategy, and the recovery plan for Hood Canal Summer Chum Salmon developed by the Hood Canal Coordinating Council. In addition to completing and now implementing these plans, the local and tribal governments, agricultural, forestry and business interests, non-governmental organizations, and individual citizens who contributed to these efforts formed watershed groups that continue to benefit local communities as forums for finding cooperative solutions to natural resource questions. State agencies are responsible to implement state government actions, as well as to fund and assist local watersheds in making on-the-ground progress in local actions. State, tribal, local and citizen partnerships are also building stewardship networks of volunteers, homeowners, realtors, farmers, business and other interests to support habitat protection in communities across Puget Sound.

Partners in protecting functioning habitats

Many communities have land trusts, salmon recovery groups, conservation organizations and others working to purchase land and conservation easements in high-value habitat areas for permanent protection, as a voluntary approach to habitat conservation. Local governments provide tax incentives to landowners and often join as partners with conservation or restoration groups in acquiring land as part of a larger restoration project.

The Interagency Committee for Outdoor Recreation (IAC) staff administers funding from several sources used by local groups to purchase land and easements. The Department of Natural Resources (DNR) designates and manages aquatic reserves in Puget Sound for areas of special ecological value. Agencies that manage state-owned land such as DNR, the departments of Fish and Wildlife (WDFW), Transportation, and State Parks and Recreation Commission (State Parks) apply a conservation approach in the context of individual agency mandates.

State agencies that have developed landscape analysis tools are transferring knowledge to local governments. These integrative tools provide better information to decision-makers by showing the combined effects of regulatory and voluntary actions on watershed and habitat-forming processes. Demonstration projects use these tools developed by resource scientists in Ecology, WDFW, and WSDOT with assistance from the Conservation Commission, CTED, Action Team staff, and federal agencies to find practical solutions to watershed issues.

As local governments implement updated ordinances, state resource agencies continue to provide support by improving scientific data, management recommendations, and training. The Department of Community, Trade and Economic Development (CTED), as the lead agency for the Growth Management Act, coordinates among state agencies. Ecology leads efforts to assist local governments in updating local SMPs. Resource agencies such as WDFW, DNR, the departments of Agriculture (WSDA) and Health, and Action Team staff provide technical assistance, data, public education, funding and guidance.

Aquatic nuisance species protection efforts are led by WSDA to monitor and prevent spartina infestations and WDFW to monitor and prevent other invasive aquatic species. Action Team staff provide coordination and support through a number of activities, including providing staff for the Ballast Water Committee. In 2006, funds from the governor's emergency fund and the supplemental budget were designated to control and eradicate non-native tunicates. The 2006 legislature also created the Invasive Species Council to coordinate on invasive species issues, and the IAC will staff this council.

Building public awareness and stewardship is a cornerstone of the approach to habitat protection in many watersheds. Washington State University (WSU) Extension, Washington Sea Grant, Action Team staff, conservation districts, and others provide funding and assistance for public involvement and education efforts. Experts from most Action Team agencies assist in education and training. The rapid expansion of Beach Watcher and Shore Steward programs, and the Soundwide success of stream teams and neighborhood bay or stream protection groups testifies to the strong commitment of Puget Sound's residents to protecting its habitats.

Opportunities for the Puget Sound Partnership in 2007-2009

The Puget Sound Partnership (see page 2) is charged with developing recommendations for a 2020 agenda that is expected to ramp up and significantly add to the overall state agency efforts put forward in this draft public review 07-09 plan. The potential activities proposed below are intended to generate input on how we might best accelerate progress in protecting functioning habitats. The Puget Sound Partnership will hold forums on these and other topics during April and May of 2006. We anticipate draft recommendations on some of these topics in June, followed by more public forums in the summer. For more information go to www.pugetsoundpartnership.org.

Support local capacity to implement salmon and watershed plans: Puget Sound communities and state agencies are actively integrating and implementing salmon recovery, watershed and other plans, including the regional nearshore chapter of the salmon recovery plan. There is a need for funding for local capacity to make on-the-ground, sustainable progress, as well as to fund actions called for in the plans.

Increase innovative land use development practices: Habitat protection requires that the Puget Sound community resolve local and regional conflicts over land use regulations. Funding can increase for incentives such as programs to transfer development rights and to bolster the growing market for sustainable building, "soft" shoreline protection, and "green" infrastructure such as low impact development.

Build on efforts to prevent aquatic nuisance species: Protecting the Sound from aquatic nuisance species calls for a comprehensive monitoring program to evaluate the effectiveness of eradication efforts and to detect new non-native species early so that the state can take appropriate action to control or eliminate them. The Puget Sound Partnership can explore ideas for funding these programs through a fee system for services related to controlling aquatic nuisance species, such as one that scales the fees to the level of compliance with state regulations.

Proposed 2007-2009 strategies for protecting functioning habitats

1. Preserve functioning habitats through a variety of conservation tools.
2. Help effectively update and implement regulations that protect shorelines and critical areas, and increase the funding and assistance for additional cities and counties to update Shoreline Master Programs with more protective programs.
3. Integrate and implement local watershed, salmon recovery and other plans through regulatory and voluntary approaches.
4. Prevent the introduction of new aquatic nuisance species in Puget Sound through regulatory and volunteer approaches.
5. Develop a network of sustainable resources to support Soundwide landowner education and stewardship.

6. Identify and fill information needs to monitor and improve the effectiveness of protection strategies.

Proposed 2007-2009 results for protecting functioning habitats

1. Preserve functioning habitats through a variety of conservation tools.
   a. Increase by ____acres the ecologically important land that is permanently protected and properly managed. This will be accomplished through DNR aquatic reserves, WDFW land acquisition (fee simple and conservation easements), and land acquisitions funded by grants administered by the IAC.
   b. Designation of____ aquatic reserves by DNR during the course of the biennium.
   c. Development of conservation leases by DNR during the course of the biennium.
2. Help effectively update and implement land use regulations that protect shorelines and critical areas, and increase the funding and assistance for additional cities and counties to update SMPs with more protective programs.
   a. King and Jefferson counties and the cities of Seattle, Burien, Shoreline, Auburn, Kirkland, Federal Way, Lynnwood, Monroe, Sammamish, Sumas, Tukwila and Woodinville complete inventories for SMP updates and are on track to amend regulations to more protective guidelines by December 1, 2009. (Ecology)
   b. Pierce, Kitsap, Thurston, Mason counties and cities within these counties receive funding for updating their SMPs and are on track to amend their SMPs with more protective programs by December 1, 2009. (Ecology—requires increased funding)
   c. Local governments receive technical assistance and inventory data to update critical areas maps as new science becomes available for effective critical areas ordinance implementation. (PSAT, WDFW, Ecology, DNR)
   d. Small cities receive a critical areas ordinance guidance document. (CTED)
   e. Guidance and training programs are developed in alternatives to "hard" shoreline armoring for state, local, tribal and federal staff and the consulting and building communities. (PSAT)
   f. Planners and the development community receive guidance and training to improve incentives and habitat protection measures related to stormwater, water quality, retaining land cover connectivity, and freshwater and marine shorelines. (Multiple agencies)
3. Integrate and implement local watershed, salmon recovery and other plans through regulatory and voluntary approaches.
   a. Local watershed groups receive resources and guidance to integrate watershed, salmon recovery and other plans to carry out actions effectively, and to evaluate and adapt actions as they manage watersheds. (WDFW, Ecology, PSAT, CTED, WSDA, Conservation Commission, DNR, Health, IAC)
   b. A state, federal and local partnership implements a unified watershed stormwater action plan in _____ watershed that meets the mandates of multiple plans. (PSAT, EPA)
   c. Local governments receive information and technical assistance on landscape analysis tools to integrate land use,

natural resource, and other information appropriate to local planning needs and budgets. (Ecology, WDFW, WSDOT)

d. Models from agricultural pilot projects to both enhance farm income and improve protection of natural resources are applied in ____ Puget Sound counties. (WSDA)

4. Prevent the introduction or expansion of new aquatic nuisance species in Puget Sound through regulatory and volunteer approaches.

   a. At least 5 percent of all vessels that arrive at Puget Sound ports are inspected, targeting high-risk vessels and conducting random inspections and sampling ballast to make sure that ballast water is properly managed. (WDFW)

   b. Ballast water samples furnished by WDFW for all vessels that arrive at Puget Sound ports are analyzed to evaluate the risks associated with these vessels for introducing non-native species to the Sound. (Sea Grant)

   c. Volunteer organizations monitor about 70 sites in Puget Sound for the presence of the invasive non-native European green crab and report their findings. (WDFW)

   d. A strategic plan is prepared that addresses invasive species issues, including agency coordination and preventing, detecting, and responding to invasive species. (IAC reports as staff to Invasive Species Council)

   e. Training and educational materials are provided to recreational divers to identify and report the presence of invasive aquatic species. (WDFW, Sea Grant, PSAT)

5. Identify and fill information needs to monitor and improve the effectiveness of protection strategies.

   a. The percent of development that occurs within Urban Growth Areas (UGAs) increases in relation to the percent that occurs outside of UGAs based on evaluating information collected from Puget Sound counties required to report on buildable lands (King, Pierce, Snohomish, Kitsap, and Thurston). (CTED)

   b. Local watershed groups receive information on regional changes in land cover and impervious surfaces to use to evaluate the effectiveness of protection strategies. (PSAT, EPA)

   c. State agencies develop guidance for monitoring and improving the effectiveness of protection strategies. (PSAT)

   d. A Geographic Information System database or "Conservation Registry" is developed that documents locations of past, present and future conservation projects located in Puget Sound region. (WDFW)

   e. Eelgrass status and trends are monitored annually throughout Puget Sound and focused studies are completed in two regions. (DNR)

   f. The effects of stressors on eelgrass abundance and distribution are evaluated at two sites. (DNR)

   g. The status and trends in floating kelp abundance and distribution are tracked. (DNR)

   h. Biodiversity in intertidal biotic communities in central and southern Puget Sound are tracked. (DNR)

6. Develop a network of sustainable resources to support Soundwide landowner education and stewardship.
    a. Shoreline landowner workshops are held in ____ counties to build stewardship behaviors that protect and restore habitats. (PSAT)
    b. At least_____ local government staff, real estate professionals, developers and citizens increase their knowledge and behaviors to better protect functioning habitats. This will include awarding _____ clock hours to real estate professionals. (WSU Extension)
    c. 400 Beach Watcher volunteers are trained and Shore Stewards increase membership in the north Sound by 1,000 members. (WSU Extension—may require additional funding)
    d. 500 tideland owners will be able to identify and maintain the tideland plants growing in their tidelands and understand their ecological value. (Sea Grant)

Priority 6: Restore degraded nearshore and freshwater habitats

Broken concrete bulkhead on West Beach Road, Whidbey Island. | *Photo by Marsha Engel*

Long-term goal: Achieve a net gain in ecological function and area of streams, nearshore, and estuarine habitats within Puget Sound.

The issue

Extensive development and land conversion throughout the Puget Sound basin over the last hundred years has resulted in significant loss of fish and wildlife habitat, on the shorelines, near rivers and streams that empty into the Sound and in the uplands. Habitat has also been impaired through the introduction of non-native and invasive species, which can alter habitats and overwhelm native species, and by derelict fishing gear such as abandoned or lost nets and crab pots.

This loss and alteration of key habitat and habitat-forming processes has led to a resulting pressure on many of the Sound's living resources, from salt marshes, eelgrass beds and forage fish. Loss of these habitats and species spreads through the food web to affect salmon, marine birds and orca whales. Protecting remaining functioning habitat and restored habitats along with work under this priority area is necessary to recovering the species in decline in Puget Sound. (See pages 28 and 29).

Habitat degradation can be seen in declining water quality, altered instream flows and water levels and lack of native vegetation, especially along streams and shorelines. Increased development in river floodplains and marine shorelines disrupts habitat-forming processes as individuals and communities attempt to manage new flooding, erosion and landslide hazards. The greatest habitat losses have occurred in areas of high population density and areas associated with major infrastructure such as roads, ports, dams, and leveed agricultural areas. A majority of the Sound's shoreline has been modified, with impacts to nearshore habitats and species that function as critical links in the food web.

State, federal, tribal and local partners working to restore freshwater and nearshore habitats focus efforts on recovering the underlying natural processes that move water, organic material, and sediment. State and federal agencies and restoration scientists making funding decisions are looking at how the projects will continue to function and support habitat-forming processes over time.

Partners in restoring degraded nearshore and freshwater habitats

State and federal agencies provide funding for habitat restoration through a variety of programs. The state Salmon Recovery Funding Board (SRFB) and Aquatic Lands Enhancement Account (ALEA) are administered by the Interagency Committee for Outdoor Recreation (IAC). Other funds are provided through the departments of Ecology, Natural Resources (DNR), Fish and Wildlife (WDFW), and the Conservation Commission. Citizen volunteers working in Regional Fisheries Enhancement Groups receive funding from WDFW for salmon

restoration activities, and cooperative groups of local and tribal governments and citizens develop and submit ranked project proposals to the SRFB through lead entities established under the Salmon Recovery Act in 1998.

All of these agencies and Action Team staff partner with the U.S. Army Corps of Engineers (ACOE)and other federal agencies under the Puget Sound Nearshore Partnership (PSNP) which explores the feasibility of large-scale nearshore ecosystem restoration. Through PSNP they benefit from improved science, strategic planning and early action implementation.

The Department of Agriculture (WSDA) receives state funding to control and eradicate spartina infestations in Puget Sound. WDFW and local groups receive some funds from WSDA for this purpose. WDFW is also the lead agency for implementing the Early Detection and Rapid Response Plan for aquatic invasive species.

Opportunities for the Puget Sound Partnership in 2007-2009

The Puget Sound Partnership (see page 2) is charged with developing recommendations for a 2020 agenda that is expected to ramp up and significantly add to the overall state agency efforts put forward in this draft public review 07-09 plan. The potential activities proposed below are intended to generate input on how we might best accelerate progress in restoring degraded habitats. The Puget Sound Partnership will hold forums on these and other topics during April and May of 2006. We anticipate draft recommendations on some of these topics in June, followed by more public forums in the summer. For more information go to www.pugetsoundpartnership.org.

Ensure completion of restoration projects funded in 2006: Construction of a number of restoration projects initiated with funding in the 2006 supplemental budget will extend into the 2007-2009 biennium. Washington State Parks and Recreation Commission (State Parks) will undertake habitat restoration projects and WDFW and the IAC will work with the PSNP, salmon restoration groups, tribal governments and the ACOE to identify and fund nearshore, estuarine, and salmon habitat restoration in high priority areas. Increased funding can accelerate coordinated progress in restoring the habitat-forming processes and other ecological functions of Puget Sound.

Support and build capacity to respond to aquatic nuisance species: In 2006, the legislature also provided funding to address invasive tunicates, a species that could destroy critical habitats. The Puget Sound Partnership can build on this initial effort to ensure that the response to this emergency is continued, in order to protect the Sound from this and other potentially devastating non-native species.

Proposed 2007-2009 strategies for restoring degraded habitats

1. Plan and undertake large-scale restoration initiatives through PSNP.
2. Improve restoration projects by applying the best scientific principles and a process-based approach.
3. Improve and streamline permitting for restoration projects.
4. Control and stop aquatic nuisance species from spreading and rapidly and effectively respond when any new species are detected.

Proposed 2007-2009 results for restoring degraded habitats

Environmental results: Restore degraded habitats

a. Projects to restore natural ecological functions increase the area of tidally and seasonally influenced estuarine wetlands by _____ acres. (IAC)
b. Projects restore riparian habitat improve conditions and processes on ____ acres

of Puget Sound shorelines, estuaries, rivers and streams. (IAC)

c. Efforts to restore and protect the natural delivery of sediment and organic matter improve the natural functions of ____ Puget Sound drift cells. (IAC)

d. Riparian habitat protected by the Conservation Reserve Enhancement Program increases by ____ new acres and ___ new stream miles. (Conservation Commission)

e. Salmon habitat is improved at _____ state parks. (State Parks)

1. Plan and undertake large-scale restoration initiatives through PSNP.

   a. Complete feasibility studies for Phase II of the PSNP study, and the Deschutes Estuary Restoration and Burlington Northern Santa Fe projects.

   b. Implement the Nisqually Estuary Restoration Project, the Final Phase of the Quloolt Estuary Restoration project, the Skokomish Estuary Restoration Project, and the Wiley Slough Skagit Estuary Restoration project.

   c. Complete _____ estuary and salmon restoration projects funded in the 2006 supplemental budget. (projects as identified for WDFW, State Parks)

2. Improve restoration projects by applying the best scientific principles and a process-based approach.

   a. Criteria for project design and funding prioritizes are developed that incorporate Guiding Restoration Principles developed by the PSNP. (IAC, WDFW)

   b. Recommendations of the *Puget Sound Salmon Recovery Plan* regional nearshore chapter are carried out in restoration projects. (IAC, WDFW)

3. Improve and streamline permitting for restoration projects.

   a. A streamlined process for Endangered Species Act consultation on restoration projects is developed by federal agencies. (ACOE, NOAA Fisheries, USFWS, and EPA)

4. Control and stop aquatic nuisance species from spreading, and rapidly and effectively respond when any new species are detected.

   a. Reduce the area of Puget Sound infested by spartina by 100 acres, or approximately 20 percent per year consistent with WSDA's 2006 Spartina Management Plan for north Puget Sound. (WSDA)

   b. Control and eliminate established populations of the club tunicate, *Styela clava* at locations in Puget Sound. (WDFW, PSAT, DNR)

   c. Develop and implement a response strategy for non-native *Styela clava* (club tunicate) and *Ciona savignyi* (transparent tunicate) in Puget Sound and Hood Canal. (WDFW, PSAT, Ecology, DNR)

   d. Develop and implement a strategy to raise the profile of invasive species as a significant environmental threat to Puget Sound.(ANS Committee: WDFW, PSAT, Ecology, DNR, WSDA, State Parks, IAC)

Priority 7: Conserve and recover species at risk

Copper rockfish. | *Photo by Jim Ramaglia*

Conserving and recovering Puget Sound's declining species requires significant progress on all of the priorities of this plan. The region's biodiversity is threatened by declines of some aquatic species to levels that signal ecosystem imbalance. This imbalance, if not corrected, could lead to ecosystem collapse. Federal and state laws require special protection efforts and recovery plans for species at risk of extinction. All of the efforts underway in other priorities of this plan to clean up and prevent pollution from entering the food web and to protect and restore habitat will benefit the species at risk, but additional actions identified in recovery and management plans will accelerate that recovery.

Orca

In 2005 the NOAA Fisheries Service designated Southern Resident orca—or killer whales—as endangered under the federal Endangered Species Act (ESA). The State Fish and Wildlife Commission in 2004 added the Southern Resident orca, the Northern Resident and transient populations of orca to the state list of endangered species. Canada has listed both the northern and southern resident whales under their Species At Risk Act. In a draft *Orca Conservation Plan for Southern Resident Killer Whales* issued in 2005, NOAA Fisheries listed toxic contamination, availability of food, and disturbance by noise and other activities as key factors in orca survival. Transient orcas prey on seals and other marine mammals and are part of a widespread population. The Northern Resident orcas are fish-eaters and spend much of their time in British Columbia but occasionally enter Washington waters.

A key prey for the Southern Resident orcas is salmon. These orcas spend summers in the transboundary waters of the San Juan Islands and may travel throughout the Sound other parts of the year. In this way, the survival of orca and is linked to salmon survival, and thus to freshwater and nearshore habitat conditions as well as open ocean habitat and fishing and hatchery decisions. Forage fish that rely on nearshore habitat are a food supply for both orca and salmon as well as many other marine fish, marine birds, and other marine mammals. Toxic contamination of orcas may occur if the orca eat bottomfish from toxic hot spots, or other fish that have accumulated toxic chemicals in their tissues as the chemicals spread through the food web. Human disturbances may occur from vessel activity and other underwater noise sources.

In addition to the NOAA Fisheries proposed *Orca Conservation Plan for Southern Resident Killer Whales*, Canada's Department of Fisheries and Oceans (DFO) has completed plans for the Northern and Southern Residents. NOAA Fisheries also protects orcas under the Marine Mammal Protection Act. A committee that includes NOAA Fisheries, the Department of Ecology (Ecology), the Environmental Protection Agency, DFO and the British Columbia Ministry of Water, Land and Air Protection

shares information and coordinates among the various recovery efforts. Puget Sound also has an active community of interested citizens with representatives in these processes.

Salmon

In 1999, NOAA Fisheries listed Puget Sound Chinook and Hood Canal summer chum salmon as threatened under the federal ESA. The U.S. Fish and Wildlife Service also listed as threatened Puget Sound stocks of bull trout. The causes of salmon declines have been broadly characterized as habitat destruction, harvest management, hatchery management, and hydropower projects. In March 2006, NOAA Fisheries proposed listing Puget Sound steelhead as threatened under the federal ESA with a final decision due in late 2006.

In addition to funding salmon habitat restoration programs (see page 34) the state helped fund the Puget Sound Shared Strategy's efforts to coordinate a Soundwide collaborative effort to develop the *Draft Puget Sound Salmon Recovery Plan* for Puget Sound Chinook salmon. Submitted to NOAA Fisheries in June 2005, the plan is currently undergoing public comment and review. At the same time, state, local, tribal and private parties are beginning to implement actions in the plan. The Shared Strategy has created a Puget Sound Salmon Recovery Council with representatives of each of the 14 watershed areas that wrote local chapters for the plan. State agencies are reviewing actions identified for their contribution, and will make commitments to carry them out. In addition, the Hood Canal Coordinating Council drafted a *Hood Canal Summer Chum Recovery Plan* with funding from the state Salmon Recovery Funding Board. It was submitted to NOAA Fisheries in October 2005 and is under review for adoption.

The Action Team will add salmon recovery plan actions to this plan for 2007-2009 and, with the Governor's Salmon Recovery Office, will track and report on them. Salmon recovery also is integrated with the Puget Sound Initiative, and federal funding provided to local watersheds will help integrate and implement watershed and salmon recovery plans.

Forage Fish

Several important species of forage fish such as surf smelt, sand lance, and Pacific herring that live and spawn on the shoreline or in the shallow nearshore marine waters of Puget Sound are the focus of management plans to address historical declines. Forage fish and their eggs are critical prey for a large variety of marine life including fish, birds, and marine mammals. Migrating and resident salmon rely on Puget Sound forage fish as they travel to and from the Pacific Ocean.

Inventories by Washington Department of Fish and Wildlife (WDFW) and others suggest that extensive shoreline development has significantly reduced the spawning habitats of surf smelt and sand lance, which occur high up on beaches and are susceptible to scouring from hard shoreline modifications such as seawalls and water pollution from runoff. Dredging, pollution and shading of nearshore waters can remove or diminish eelgrass beds that herring use as spawning habitat. Pacific herring stocks declined sharply in the north Sound (Cherry Point) and Discovery Bay in the early 1990s although there were slight increases in the central and south Sound stocks during the same timeframe. Although NOAA Fisheries reviewed the severe decline of the Cherry Point herring stock for listing under the ESA, in 2005 it determined that the stock does not qualify for protection because it does not meet the standards for a "species" under the ESA. Both of these stocks have demonstrated some limited recovery during the ensuing period.

WDFW has a forage fish management plan and is transferring years of inventory data to digital maps to make available to local governments

and restoration groups. A number of recent local government critical areas ordinance updates added forage fish protection measures. Marine resource committees, salmon restoration groups, tribes and others are undertaking inventory and mapping projects to better understand and protect these species. Shoreline landowner education conducted by Action Team staff, Ecology, Washington Sea Grant, Washington State University Extension, other agencies and local partners helps to increase awareness and improve protections along targeted shorelines.

While certain forage fish stocks are in decline, anchovies have been documented in recent years in south Puget Sound and are the subject of a work group of state, tribal, federal and other scientists to understand whether this signals a change in the ecosystem, and how significant this species is to the food web in Puget Sound.

Groundfish

Puget Sound groundfish include over 150 species, including sharks, rockfishes, codfishes, flatfishes and lingcod, among others. They make up a high percent of the biomass of the ecosystem. Several key species including rockfishes, dogfish, Pacific cod, Pacific hake, and walleye Pollock have undergone dramatic declines during the past twenty years. Eighteen species were reviewed for listing under the federal ESA by NOAA Fisheries. Although the petition was denied in 2000, the federal agency concluded that Pacific hake are a candidate species and other species are vulnerable. They recommended that the state impose stronger conservation measures and target meaningful recovery efforts.

WDFW manages groundfish under the terms of the Puget Sound Groundfish Management Plan and has limited fisheries and, under the approval of the state Fish and Wildlife Commission, has also been establishing a series of Marine Protected Areas/Conservation Areas as part of a rockfish recovery effort in Puget Sound. The long-term strategy is to provide a series of such sites in geographically separate areas coupled with other management tools to help recover Puget Sound rockfish populations.

WDFW is completing a review of status and trends of several species of rockfish and developing a rockfish management and conservation plan. Rockfish are slow-growing, long-lived and many are not migratory, so they are susceptible to fishing pressure. WDFW conducts surveys and studies of rockfishes and other groundfish species and will be implementing new conservation measures for rockfishes. Marine Resource Committees and the Northwest Straits Commission have worked to draw attention to the problem in local communities, including establishing voluntary bottomfish protection areas and a Marine Stewardship Area in San Juan County.

Marine Birds

More than 100 species of marine birds, including seabirds, seaducks and shorebirds*, are full or part-year residents of Puget Sound. Like salmon and orca, many marine birds are at or near the top of the food web and are thus important indicators of overall ecosystem health. Unfortunately, like salmon and orca, significant declines have occurred in the region's marine bird populations. Fourteen of 18 marine bird species studied between 1978-1979 and again in 1992-1999 have experienced a 56 to 95 percent decline since 1979. The total number of marine birds in the region dropped 47 percent during this same time period. A variety of human and natural sources are blamed for these

* **Seabirds** are birds (except waterfowl) that frequent coastal waters and the open ocean, such as gulls, murres, pelicans, cormorants and albatrosses. **Seaducks** are diving ducks that frequent the sea, such as scoters, harlequins, long-tailed ducks, and mergansers. **Shorebirds** are any bird that frequents the seashore such as western sandpipers and black oystercatchers. The term **marine birds** is used in this document to capture all three categories.

declines, though scientists do not fully understand what is causing the severe declines.

Unlike Chinook and Hood Canal summer chum salmon and orca, few of these at-risk species are protected under state or federal law. Only three species—brown pelicans, marbled murrelets and common loons—are listed as threatened species in Washington State. The brown pelican and marbled murrelet are also listed as threatened under the federal ESA. Six others are state "candidate" species, including western grebe, common murre, Brandt's cormorant, Cassin's auklet, tufted puffin and short-tailed albatross. The pigeon guillemot, whose numbers have declined by 55 percent since 1979, is not listed as a candidate under state or federal endangered species acts. Surf scoters, whose numbers are down 70 percent for the same time period, are ineligible for listing in the state due to their status as a game bird. Federal and state agencies responsible for managing marine birds in Puget Sound acknowledge that they need to improve coordination and add resources, particularly in prioritizing research activities, identifying science, management and education gaps, and implementing conservation measures.

WDFW biologists are conducting ongoing monitoring and focused studies of selected marine bird populations and are gathering data needed for reports on the status of candidate species. Audubon Washington is developing a site conservation strategy for Port Susan Bay, which is considered key habitat for many marine birds. WDFW and Action Team staff are providing technical and conservation planning assistance to this effort. Marine birds rely for survival on a complex balance between habitats and available food for survival, and those with serious declines are less able to adapt to changes in timing, prey or habitat conditions.

Native shellfish

The Olympia oyster (*Ostreola conchapila)* is the only oyster species native to the Pacific northwest. Although not threatened in its native range, the Olympia oyster is staging a comeback in many areas of Puget Sound. These oysters historically existed in abundance in south Puget Sound and Willapa Bay, but their numbers have been reduced by pollution, over-harvesting, habitat loss, and conversion of native oyster grounds to other economically valuable species. The Puget Sound Restoration Fund, a non-profit organization, works closely with the public and private sectors, local and tribal governments, Marine Resource Committees and private tideland owners to reestablish the Olympia oyster in sites from the Northwest Straits area to Sinclair Inlet and inlets of the South Sound.

WDFW has guidelines for restoring Olympia oysters in Washington State that are designed to preserve the genetic integrity of remaining populations by seeding new locations with brood oysters from the same management area. WDFW developed a plan for rebuilding stocks of Olympia oysters, but implementation actions have not been funded. Reestablishing this species also requires protection of water quality to sanitation standards that allow for shellfish harvest and human consumption.

Proposed 2007-2009 strategies for conserving and recovering species at risk

1. Achieve significant progress on priorities 1 through 6 of this document for overall ecosystem and food web protection and recovery to support recovery of these species.
2. Implement the *Puget Sound Salmon Recovery Plan,* the *Hood Canal Summer Chum Recovery Plan,* the *Recovery Plan for the Coastal-Puget Sound Bull Trout* and the *Proposed Conservation Plan for Southern Resident Killer Whales (Orcinus orca).* Use monitoring, coordination and adaptive management to evaluate and modify the implementation.

3. In anticipation of completion of a rockfish conservation plan, support regulatory and voluntary tools for rockfish recovery.
4. Launch a multi-agency effort to assess the relative abundance and geographic distribution of major forage fish species in Puget Sound as the basis for management and recovery strategies.
5. Identify research needs and develop management strategies for marine bird populations considered at risk.
6. Increase efforts to reestablish and protect Puget Sound Olympia oyster populations.

Proposed 2007-2009 results for conserving and recovering species at risk

Orca

a. The strategies and priority actions of the orca conservation plan are implemented.

b. Implementation of the NOAA Fisheries Service orca conservation plan is coordinated with the conservation plan of Canada's DFO.

Salmon

a. Hatchery and natural chinook integration plans will be developed for chinook populations included within the NOAA Fisheries Hatchery Listing Policy, consistent with the Hatchery Reform Project of Puget Sound. (WDFW, Tribal Governments)

b. Additional chinook salmon recovery exploitation rates, to include the Puyallup, Nooksack and Nisqually rivers will be developed consistent with the adaptive management strategy in the Puget Sound Chinook Harvest Management Plan. Recovery exploitation rates defined in the current plan will be refined as new stock and fishery data are collected reflecting improved estimates of actual exploitation rates, escapement, and survival (WDFW, Tribal Governments)

c. State agency actions in the *Draft Puget Sound Salmon Recovery Plan* and draft *Hood Canal Summer Chum Recovery Plan* begin implementation. (All agencies)

d. Indicators for salmon recovery plan implementation are tracked and reported. (Governor's Salmon Recovery Office)

Marine fish

a. WDFW's Forage Fish Management Plan is implemented.

b. A comprehensive forage fish assessment, monitoring and research plan tailored to important species in Puget Sound and compatible with the Fish and Wildlife Commission's Forage Fish Management plan is designed and begins implementation. (WDFW, USGS, NWSC, NOAA Fisheries, NWIFC or interested tribes, Sea Grant, Sea Doc Society—depends on additional funding)

c. Direct and indirect harvest impacts on rockfish are minimized. (WDFW)

Marine birds

a. Complete final status reports for "candidate" species to determine whether a listing is warranted. Species include western grebe, common murre, Brandt's cormorant, Cassin's auklet, tufted puffin and short-tailed albatross. (WDFW)

b. Complete and implement recovery plan for marbled murrelet. (WDFW)

c. Develop conservation plan for at-risk marine bird species in Puget Sound. (PSAT and WDFW)

d. Protections for at-risk species are incorporated into Shoreline Master Program updates in _____ jurisdictions. (PSAT, CTED)

e. Local conservation groups and the public receive education on issues related to at risk marine birds. (PSAT, WDFW)

f. Surveys of residential and wintering marine bird species in decline are expanded, and monitoring activities investigate sources of marine bird declines. (WDFW)

g. The best achievable protection is provided from the risk oil spills pose to marine diving birds. (Ecology)

Native shellfish

a. Funding and other resources are identified to implement the plan to rebuild Olympia oyster stocks. (WDFW)

b. State agencies support the efforts of the Puget Sound Restoration Fund and other partners to reestablish Olympia oyster populations in Puget Sound. (WDFW, PSAT, Sea Grant)

Priority 8: Prepare for and adapt Puget Sound efforts to a changing climate

Scientists monitoring global changes in climate agree that greenhouse gases heat the planet and that climate change has begun and will continue far into the future from the emissions human activities have already produced. The majority of scientists who study this problem agree on these facts. There is uncertainty, however, in predicting how much the planet will warm, at what rate, and what the impacts will be in particular regions.

The Puget Sound Action Team released a report in 2005 developed by the Climate Impacts Group at the University of Washington that documented the changes in Pacific Northwest climate and hydrologic patterns to date, and identified Puget Sound ecosystem conditions and resources likely to experience impacts under future changes as predicted by climate models.* The scientists predict that region is likely to experience average warming of several degrees by mid-century, with modest increases in winter precipitation, but greater runoff in streams because more precipitation will fall as rain rather than snow. The snowpack that feeds and cools many rivers in the basin in spring and early summer will decrease, and the region will experience higher winter flows, including more flooding, and lower flows during spring and summer. Global relative sea level rise will accelerate in Puget Sound, especially in the south Sound where the land is sinking compared to the crustal uplift in the north and northwest parts of the basin.

Impacts on the Puget Sound ecosystem from these changes will include greater stress for salmon and other freshwater aquatic species, changes to Puget Sound circulation, salinity and stratification patterns, and potentially, warmer water temperatures. Fragile marine aquatic species whose life-cycles depend on narrow ranges of conditions will be most severely affected. Nearshore salt marshes and other estuarine habitats that many species depend upon at critical life stages would be at risk of erosion, flooding and other changes. Increased bluff erosion and human efforts to hold back this process could further imbalance the Sound's nearshore habitats.

Efforts to protect and restore Puget Sound's biodiversity and water quality will not be successful if they occur outside of the context of regional

* Snover, A.K., P.W. Mote, L. Whitely Binder, A.F. Hamlet, and N.J. Manua. 2005. *Uncertain Future: Climate Change and its Effects on Puget Sound.* A report for the Puget Sound Action Team by the Climate Impacts Group (Center for Science in the Earth System, Joint Institute for the Study of the Atmosphere and Oceans, University of Washington, Seattle).

changes in climate. It is a priority to increase our understanding of the nature and rate of these changes and take actions to increase the adaptability of regional ecosystems to them. Decision-makers and resource managers will benefit from monitoring information and models for managing risks to vulnerable ecosystem processes. The Action Team partnership will begin to consider climate change impacts as it addresses other Puget Sound priorities and will incorporate an approach that increases the region's flexibility and adaptability to changing ecosystem conditions.

Proposed 2007-2009 strategies to prepare and adapt efforts to a changing climate

1. Support, track and report on science related to the effects of climate change on the Puget Sound ecosystem.
2. Provide risk-assessment models to help identify vulnerabilities to existing infrastructure and work with affected agencies to prepare for or respond to potential impacts.
3. Review state, federal and local activities and expenditures on conservation and recovery in the Puget Sound basin in light of climate change impacts, and make specific recommendations for changes, if necessary.
4. Make specific recommendations on management and planning adaptations in response to climate change for all levels of government in Puget Sound.

Proposed 2007-2009 results to prepare and adapt efforts to a changing climate

1. Support, track and report on science related to the effects of climate change on the Puget Sound ecosystem.
    a. Semiannual reports are provided on the most recent scientific studies relating to climate change and its impact on marine systems.
    b. A workshop is held for regional scientists and resource managers to exchange research findings on the implications of climate change to the Puget Sound region.
2. Provide risk-assessment models to help identify vulnerabilities to existing infrastructure and work with affected agencies to prepare for or respond to impacts.
    a. A risk-assessment model applicable to Puget Sound is provided to state, local and tribal government agencies.
    b. Key individuals in federal, state, local and tribal agencies identify how a risk-assessment model meets their needs and ____percent apply the model to drafting risk-assessment plans for their areas of responsibility.
    c. A Geographic Information System analysis of Puget Sound is conducted to identify existing infrastructure that is potentially at risk from the likely impacts of climate change.
3. Review state, federal and local activities and expenditures on conservation and recovery in the Puget Sound basin in light of climate change impacts, and make recommendations for changes, if necessary.
    a. A "case statement" is produced to address the most recent research relating to implications to conservation and recovery activities, with recommendations for changes to these activities.
    b. Regional leaders working on conservation and recovery projects incorporate the recommendations on possible climate change impacts into conservation and recovery plans.

4. Make recommendations on management and planning adaptations in response to climate change for all levels of government in Puget Sound.
   a. A strategy for state agencies is developed to examine how resource management policies would perform in the future if various elements of climate were altered.
   b. A system to monitor and report on regional climate and ecosystems for ongoing changes is developed with an adaptive management loop to incorporate monitoring findings into management and planning decisions.

Coordinating Puget Sound conservation and recovery

Bill Dewey (center), public affairs manager for Taylor Shellfish Co., Inc. and member of the Puget Sound Council explains the company's Oakland Bay shellfish operation in Mason County. | *Photo by Kevin Anderson*

Long-term goal: Provide the state's institutional framework to lead and coordinate the protection and restoration of Puget Sound.

In response to the challenges facing Puget Sound, in 1996 the Washington State Legislature created the Puget Sound Action Team (Action Team) as the successor to the Puget Sound Water Quality Authority. The Action Team's mission is to protect and restore Puget Sound and its spectacular diversity of life, now and for future generations. The Action Team works as a partnership to protect and restore the water quality, habitat and biological resources of Puget Sound and to recover species at risk.

The Action Team structure is made up of three interrelated entities:

- The Puget Sound Action Team is a 17-member governing body that includes directors from 10 state agencies, representatives from three federal agencies, one representative of tribal governments, two representatives of local governments (city and county), and a chairperson appointed by the Governor.
- The Puget Sound Council (Council) provides guidance to the Action Team and reviews its progress. It is made up of seven representatives of leading Puget Sound interests, including tribal governments, counties, cities, agriculture, the environmental community, the shellfish industry, and the business community, four representatives of the Washington State Legislature, and the chairperson of the Action Team.
- The Action Team staff provides professional and technical services to help the partner agencies and others in their efforts to protect, restore and sustain the Sound.

Proposed 2007-2009 strategies for coordinating Puget Sound protection and conservation

1. Define, coordinate, and implement the state's environmental agenda for Puget Sound.
2. Develop specific strategies and courses of action for Puget Sound's existing and emerging conservation needs, evaluate the effectiveness of those strategies and actions, and build upon success.
3. Engage and involve Puget Sound governments, organizations, and citizens in efforts to protect and restore Puget Sound.
4. Implement the recommendations of the Puget Sound Partnership for a 2020 Agenda, engaging and educating the public, funding and governance issues, and Puget Sound science.

Proposed 2007-2009 results for coordinating Puget Sound protection and conservation

1. Define, coordinate and implement the state's environmental agenda for Puget Sound.
    a. Progress is achieved on priorities in the *2007-2009 Puget Sound Conservation and Recovery Plan.*
    b. A report on the Action Team's progress is submitted to the governor, the legislature and the public by December 2008.
    c. A Puget Sound plan of work and budget for the 2009-2011 biennium is prepared, approved, and submitted to the governor and the legislature.
    d. The *Puget Sound Water Quality Management Plan* is updated as appropriate to incorporate salmon recovery plans, water quantity plans and to show connections with other regional plans.
2. Develop specific strategies and courses of action for Puget Sound's existing and emerging conservation needs, evaluate the effectiveness of those strategies and actions, and build upon success.
    a. The Puget Sound Council assesses the work of the Action Team partnership and makes recommendations for improvements and new areas and ways of engagement.
    b. Action Team staff functions as an effective advocate for Puget Sound and its existing and emerging conservation needs.
    c. Interagency teams coordinated by Action Team staff develop and implement strategies to address priority issues and evaluate the effectiveness of those strategies.
    d. Action Team staff maintain a web-accessible Geographic Information System database for Puget Sound with information to support and show progress in priority areas.
    e. Action Team staff monitor current and emerging conservation and environmental issues in Puget Sound, track and participate in developing policies and practical solutions, and find and promote alternatives to activities and projects that may harm Puget Sound's marine and freshwater environment.
3. Engage and involve Puget Sound governments, organizations, and citizens in efforts to protect and restore Puget Sound.
    a. The Puget Sound Council actively communicates with key constituencies to improve collaboration, partnerships, and communication.
    b. Outreach, technical assistance and funding for Public Involvement and Education (PIE) program projects are provided to governments, community groups, businesses, organizations and individual. PIE projects reach ____ citizens with education directed at behavior change and to raise awareness around priorities.
    c. The Puget Sound community is provided with accurate, relevant and accessible information on the status of the Puget Sound ecosystem, issues related to the health of the ecosystem, and activities of the Puget Sound Action Team.
    d. Resources are provided to support Puget Sound education in schools in partnership with the Office of the Superintendent of Public Instruction.
4. Implement the recommendations of the Puget Sound Partnership for a 2020 Agenda, engaging and educating the public, funding and governance issues, and Puget Sound science.
    a. Placeholder for recommendations available in October 2006.

The Role of Science in Puget Sound in 2007-2009

Scientists from the Puget Sound Ambient monitoring program conduct research on English sole in Elliot Bay. | *Photo by Sarah Brace*

Long-term goal: Assess the health of Puget Sound and its resources and communicate information to promote informed choices for the environmental management of Puget Sound.

Science is a foundation for the work of Puget Sound Action Team agencies to conserve and recover Puget Sound. Scientists from a number of federal, state, local and trial governments, universities, colleges, environmental organizations, and industry groups collaborate and share information on the Puget Sound ecosystem. The scope of their work includes examining how the ecosystem functions and the influence of humans on the ecosystem. Long-term monitoring helps to detect changes and measure the effectiveness of our management activities, while other studies focus on cause-and-effect relationships to help shape management solutions.

In 2005 the Puget Sound Assessment and Monitoring Program (PSAMP) conducted a focused review to evaluate how well the program assesses the health of Puget Sound and our management strategies and fills science gaps to help develop management actions. The evaluation also looked at how well the PSAMP structure works to meet its mandate. The review panel identified the program's strengths and areas needing improvement. Recommendations to the Action Team for three major improvements include:

- Strengthen connections between PSAMP, the Puget Sound Action Team and the Puget Sound Council to better coordinate scientific findings with management actions.
- Strengthen the connection between PSAMP and key external entities and processes such as the Governor's Monitoring Forum, the Puget Sound Ecosystem-Based Management program led by the Northwest Fisheries Science Center, the Puget Sound Nearshore Partnership, and the Shared Strategy Salmon Recovery Council.
- Expand the scope of PSAMP to include ambient, effectiveness and validation monitoring, to provide science advice, and to include participants from all relevant regional monitoring and assessment programs.

As one of its five charges from the governor, the Puget Sound Partnership is evaluating the broad scope of Puget Sound science activities

and programs that currently exist (see page 2). A committee of scientists will examine Puget Sound science, including the results of the PSAMP review. The governor has asked for recommendations on how to better structure and coordinate science to identify and fill gaps, communicate information to decision-makers and the public, and guide work to protect and restore Puget Sound. The strategies and results in this 2007-2009 plan on Puget Sound science are designed to be integrated and coordinated the Puget Sound Partnership's efforts.

Proposed 2007-2009 strategies for the role of science

1. Continue ongoing monitoring of the status and trends of key components of the Puget Sound ecosystem.
2. Provide scientific information to stakeholders, decision-makers and the public.
3. Direct new monitoring activities to focus on the effectiveness of management activities and policy initiatives.
4. Develop a roadmap to prioritize, finance and conduct focused research on emerging topics or research questions that are brought forth through PSAMP and science programs.

Proposed 2007-2009 results for the role of science

1. Continue ongoing monitoring and initiate new monitoring of the status and trends of key components of the Puget Sound ecosystem.
    a. Information from monitoring the ongoing status and trends is used to determine if conditions are improving or declining for forage fish, ground fish, marine birds, eelgrass, sediments and water quality and other components of the Puget Sound ecosystem.
    b. Data from status and trends monitoring is used to watch for 'red flags' (e.g. species declines, deteriorating water quality and habitat degradation) and, with federal state and local agencies to launch diagnostic studies on red flag issues in a timely manner.
    c. Threats to human health from marine environmental conditions such as harmful algal blooms, domoic acid, paralytic shellfish poisoning and other water contaminants are identified and measured.
    d. Threats to human and marine wildlife health from exposure to major contaminants (polychlorinated biphenyls or PCBs, polybrominated diphenyl ethers or PBDEs, mercury, polyaromatic hydrocarbons or PAHs, metals and pesticides) and new emerging contaminants (pharmaceuticals and personal care products, others) are identified and measured in key indicators in the food web including mussels, herring, salmon, and seals.
2. Provide scientific information to stakeholders, decision-makers and the public.
    a. Research and monitoring results are disseminated to managers via technical publications, PSAT newsletters, meetings and workshops and the 2009 Puget Sound-Georgia Basin research conference.
    b. PSAMP 'open house' meetings are conducted 3-4 times per year for stakeholders and the general public to engage with PSAMP committee members on key science issues.

c. A conceptual model of Puget Sound is developed using data from PSAMP, the Puget Sound Nearshore Partnership and other science programs to communicate and organize scientific information, relationships and results across the priorities.

d. Implications of scientific results are presented for adaptive management of Puget Sound ecosystems.

e. Scientific information is provided to quantify and understand tradeoffs between sectors.

f. Quantifiable and measurable goals and performance measures are used.

3. Direct new monitoring activities to focus on the effectiveness of management activities and policy initiatives.

   a. The contributions of key toxic contaminants from terrestrial, atmospheric and marine discharge sources are determined. This information is used to determine toxic loading in sediments and key fish, mammal and water bodies in Puget Sound.

   b. A conceptual model of Puget Sound (see 2.c above) is used to predict changes in conditions of ecosystem components with application of specific management activities and to help drive management decisions.

   c. The success of management activities is evaluated through analysis of monitoring data on the implementation and effectiveness of management and policy initiatives.

   d. Introduce a new indicator that tracks the number of acres of contaminated sediments within Puget Sound.

4. Develop a roadmap to prioritize, finance and conduct focused research on emerging topics or research questions that are brought forth through PSAMP and science programs.

   a. A work plan is developed for science activities in Puget Sound that describes the status and trends, effectiveness monitoring and research tasks that will be carried out by state agencies, and the funding level and for each activity.

   b. A mass balance model of toxics sources, reservoirs and pathways and risk to ecosystem components is developed.

   c. A mass balance model of nutrient sources, reservoirs and pathways and risk to ecosystem components is developed.

   d. Ongoing studies are expanded to include integrate social sciences, including economics, with the natural science studies of Puget Sound.

Puget Sound Science and Research Needs

PSAMP scientists have identified the following research needs as potential components of the roadmap for focused scientific research. These proposed activities are provided to invite feedback to PSAMP in developing a plan of work for 2007-2009.

Priority 1: Clean up contaminated sites and sediments

1. Link contaminants in sediments to habitat functions, and conservation and recovery of species at risk.
2. Develop methods to measure new contaminants of concern.
3. Continue PSAMP status and trends monitoring of sediments to determine spatial extent of contamination, toxicity and benthos impairment within regions of Puget Sound.
4. Develop a new "urban embayment" layer to PSAMP regional and strata layers for

spatial extent calculations as well as an assessment of sediment quality to measure success of contaminated site cleanup.

Priority 2: Prevent toxic contamination

1. Initiate sediment quality monitoring on intertidal lands.
2. Develop a quantitative model to determine baseline levels of inputs and the fate of toxics in Puget Sound with explicit consideration of forage fish (by age class and location), birds, fish and mammals.
3. Develop biological indicators of toxic exposure and effects at multiple taxonomic levels, invertebrates to birds and mammals.
4. Develop comprehensive and extensive integrated contaminant monitoring plans to track pathways and burdens and link to human consumption advisories.
5. Monitor sediment quality at Soundwide, regional, strata and bay level for conventional contaminants and newly emerging contaminants.
6. Collect baseline sediment quality data, then compare it with new data to determine changes over time (improvements or further degradation).
7. Develop human health standards for PBDEs (such as flame retardants).
8. Develop methods to accurately and precisely measure new contaminants of concern in biota.

Priority 3: Prevent harm from stormwater runoff

1. Monitor effects of mixtures and interactions of nutrients, organics and metals, not isolated contaminants.
2. Determine impacts of change in hydrology resulting from dams and stormwater infrastructure.

Priority 4: Prevent nutrient and pathogen pollution

1. Assess the factors causing the intermittent production of domoic acid.
2. Monitor dissolved oxygen levels in the Strait of Juan de Fuca, the source of marine water for greater Puget Sound, including Hood Canal.
3. Monitor paralytic shellfish poisoning (PSP) with "sentinel mussel" program to protect human health.
4. Build and populate a model for the fate and transport of nutrients in the Puget Sound ecosystem based on the Puget Sound conceptual model.
5. Enhance monitoring of pathogens in swimming areas.

Special focus area: Hood Canal

1. Evaluate effects of stressors on eelgrass abundance and distribution in Hood Canal.
2. Monitor status of fish and invertebrates and response to low dissolved oxygen in Hood Canal.

Priority 5: Protect functioning nearshore and freshwater habitats

1. Inventory and map all Puget Sound marine and nearshore habitats with multibeam sonar and LIDAR.
2. Integrate WDFW Hydraulic Project Approval actions with nearshore inventories to monitor changes to the nearshore and to watersheds.
3. Monitor eelgrass status and trends annually throughout Puget Sound and complete focus studies in two regions.
4. Evaluate the effects of stressors on eelgrass abundance and distribution at two sites.
5. Track status and trends in floating kelp abundance and distribution.

6. Track biodiversity in intertidal biotic communities in central and southern Puget Sound.
7. Monitor changes in shoreline armoring in Puget Sound and the effects of different types of armoring on nearshore processes.
8. Monitor status and trends of contamination by nutrients, pathogens and toxics on nearshore habitats.
9. Identify and map forage fish spawning areas.
10. Develop a conceptual model to organize and communicate scientific information, relationships and results.
11. Characterize benthic, deepwater marine habitats.
12. Develop and monitor indicators of deepwater marine habitat health.
13. Monitor implementation and effectiveness of HPA projects.
14. Monitor effectiveness of marine protected areas as a habitat conservation tool.
15. Assess the effectiveness of local plans and regulatory processes in protecting nearshore habitats (GMA, SMA, salmon recovery, watershed plans).
16. Update and improve nearshore inventory data that is provided to local governments.

Priority 6: Restore degraded nearshore and freshwater habitats

1. Monitor amount of derelict fishing gear recovered.
2. Determine effects of derelict fishing gear on habitats, species and productivity.
3. Improve information on effects of fishing on habitats.
4. Track the amount of areas open to various types of fishing activities.
5. Use a science-based approach to set goals for habitat abundance and distribution needed to support target species assemblages and productivity.
6. Improve the understanding of nearshore ecosystem processes and linkages to watershed and marine systems.
7. Improve the understanding of effects of human activities on nearshore ecosystem processes.
8. Improve the understanding of and ability to predict the incremental and cumulative effects of restoration and preservations actions on nearshore ecosystems.
9. Improve the understanding of the effects of social, cultural, and economic values on restoration and protection of nearshore in Puget Sound.
10. Improve the understanding of the relationships of nearshore processes to important ecosystem functions such as support of human health and at-risk species.
11. Monitor effectiveness of individual restoration projects with restoration efforts that plan for and fund validation and effectiveness monitoring.
12. Monitor and assess water quality changes at restoration sites in addition to structural habitat parameters.
13. Monitor the amount of nearshore and deep water habitat disrupted by filling, dredging and dumping.
14. Monitor short and long-term changes to sediments and substrates and the biological communities associated with them.
15. Use tagging and other studies to estimate the mortality to fish populations or amount of habitat change due to fishing.

Priority 7: Conserve and recover species at risk

1. Develop other strategies to assess and conserve dogfish, Pacific cod, walleye

Pollock, Pacific hake and other depressed or keystone species in the Puget Sound ecosystem.

2. Continue assessing the effectiveness of marine protected areas for recovering rockfishes.
3. Assess forage fish populations and productivity.
4. Monitor the number of herring stocks in healthy condition.
5. Track the number of fisheries not limiting the productivity of marine species.
6. Track the number of forage fish spawning grounds in healthy condition.
7. Monitor plankton abundance and diversity.
8. Monitor the status of abalone populations.
9. Monitor the status of sea urchin, cucumber and geoduck populations.
10. Develop quantification of habitats needed to achieve specific population goals.
11. Link processes, structure, habitats and stressors to species through a conceptual model.
12. Assess whether density dependent effects are suppressing the recovery of species at risk (Allee Effect).
13. Assess how the adult abundance of forage and selected groundfishes relate to the abundance of juvenile stages preyed upon by birds and mammals.
14. Assess the relationship between biodiversity, ecosystem health and productivity.
15. Assess the ability to detect the causes of decline or efforts to recover them from natural variability in recruitment, climate, mortality and other biological parameters.
16. Assess the key predator-prey linkages between major guilds and habitat complexes and the effectiveness of modeling with ECOPATH and ECOSIM.
17. Compare fishery-dependent and independent stock assessment methods to each other for status and trends of indicators

Priority 8: Prepare for and adapt Puget Sound efforts to a changing climate

1. Monitor changes in abundance and demographic structure of temperature-sensitive species.
2. Track sea-level changes.
3. Assess effectiveness of hatchery supplementation for recovering coldwater species under climate change.
4. Monitor changes in biodiversity of key species groups.

Glossary of Planning Terms

2007-2009 Puget Sound Conservation and Recovery Plan: A biennial plan of work for the Puget Sound Action Team Partnership mandated by Chapter 90.71.050 Revised Code of Washington. The public review draft plan includes proposed strategies and results from state agencies for public input. The plan submitted to the governor and the legislature in fall 2006 will include budget information and activities submitted by state agencies and university programs to be considered by the governor and the legislature in the budget for July 2005 to July 2007. It does not include everything happening in the state government on Puget Sound. The September plan will include some high level actions for federal, local and tribal governments.

Priority: The priorities break down the goals of the long-term *Puget Sound Water Quality Management Plan* into smaller, more specific pieces that focus the work of the Action Team on the objectives that are the most important to make progress on together during the 2005-2007 biennium, based on an assessment of the existing threats and opportunities in Puget Sound.

Long-term goal: For each priority this is an environmental condition or outcome that represents a significant aspect of resolving the problem over a time period that extends beyond the two-year budget period.

Strategies: For each priority these are the key methods or approaches that describe how the partnership will achieve progress on the priority during the two-year budget period.

Proposed results: Each priority includes proposed results that Action Team partners have identified along with measures of progress they are proposing to achieve, based on funding they receive under the 2005-2007 biennial budget. The partnership will use public feedback on these results and measures to develop their work plans and budget proposals for the two-year period.

A comprehensive glossary of terms used in this plan is in the *Puget Sound Water Quality Management Plan* at http://www.psat.wa.gov/Publications/manplan00/mp_index.htm.